ELECTRICAL REVIEW
AND
WESTERN ELECTRICIAN

VOL. LVI, NO. 7. CHICAGO, SATURDAY, FEBRUARY 12, 1910. ISSUED WEEKLY.

BY THE
ELECTRICAL REVIEW PUBLISHING COMPANY
CHARLES W. PRICE, President and Treasurer.
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PUBLICATION OFFICE: MARQUETTE BUILDING, CHICAGO

EASTERN DEPARTMENT . . . . . 13 Park Row, New York.
E. E. Wood.
EUROPEAN OFFICE . . . . . 42 Old Broad Street, London, E. C.
Henry W. Hall.

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SUBSCRIPTIONS.

One Year, United States $3.00
One Year, Canada 4.00
One Year, Foreign Countries 6.00
Single Copy, 10 cents. Back numbers, beyond one month, each . .25

Entered as second-class matter, November 7, 1908, at the Post Office at Chicago, Ill., under the Act of March 3, 1879.

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THE COST OF LIVING AND THE QUESTION OF THE FUTURE.

Speaking before the New England Railroad Club at a dinner given at the Hotel Somerset, Boston, on the evening of January 12, Mr. William C. Brown, president of the New York Central Lines, called attention to the great advance in prices of the product of farms, factories and mines in the United States. During the ten years from 1899 to 1909 there has been an almost continuous and uninterrupted increase. With the succession of bountiful harvests the price of grain has steadily advanced, and with no disease or epidemic to deplete our flocks and herds, the values of live stock have also increased. These increases range from 111.2 per cent for grain to 34.1 per cent for barley. Notwithstanding the advent of the automobile, horses and mules show an increase in value of more than 160 per cent. Milch cows show an increase in value of more than nine per cent, sheep 24.7 per cent and swine forty-four per cent. The productions of the forest make an equally remarkable showing, yellow and white pine, hemlock, oak and poplar showing an advance of about seventy-three per cent. It is the same with cotton goods, fleece and wool. Anthracite and bituminous coal have advanced twenty-nine per cent and forty-two per cent respectively. The pay of labor has steadily advanced and must continue to advance in some fair ratio with the increase in the cost of things that labor must buy. To put it in another way wages must go up in the same proportion as the purchasing power of what the laborer earns goes down.

Mr. Brown points out, that, paradoxical as it may seem, increase in the production of gold, instead of decreasing the cost of living, essentially increases this cost; because, as the volume of the precious metal increases and its standard of buying power remains fixed, more must be given in payment for a commodity as the volume of gold increases in greater proportion than the commodity available. This increase in cost, however, so far as it is produced by the increased volume of gold is not a feature that need cause apprehension or alarm. The element that is working for higher cost of living more insistently, more powerfully and with a sinister significance compared with which all the others become negligible factors, is the alarming rapidity with which consumption of the products of the nation's farms is overtaking production.

This is not a reflection upon the American farmer. As

a matter of fact his has been a wonderful work. Upon analysis it seems marvelous that with the implements at hand, without scientific knowledge of the tilling of the soil and the rotation of crops he has been able to maintain production so as to keep any sort of a balance with the enormous development in the nation's demand.

Mr. Brown points out the necessity for arousing the farmers to the country's needs and to their own opportunities and possibilities. Experimental farms should be established in every county of every state, where the most modern methods of fertilization and cultivation and the results of such methods can be demonstrated.

At the present time one of the most serious problems which the farmer has to face is that of labor. There are probably fewer skilled men at work in the fields than in any other calling appertaining to civilized nations. The man upon whom the farmer has to rely in most cases is one who makes the farm his refuge rather than his calling. The long hours of labor, the hard work and the isolation of many farm communities have all militated toward this condition.

However, this problem is not insurmountable, and in the working out of the farmer's difficulties electricity is going to play a most important part. The benefits of the telephone and the high-speed interurban car are all greatly appreciated by rural and farming communities. When our great water powers are properly developed and electrical transmission lines penetrate into every section of our farming country, the arid lands will be made to become fertile through irrigation, cheap power for all purposes will be available, the isolation will be dispelled, and beyond all this hundreds of thousands of acres of richly fertile soil will be taken up for farming purposes when electrical communication and transportation shall render these locations adjacent to larger centers of population.

ELECTRIC POWER

Power is the great undeveloped field for electrical supply.

Some years ago electric power had displaced every stationary steam engine in the City of Niagara Falls.

This result was, of course, due to the cheap electric energy developed by water power, but the great economy of engine operation on a large scale appears to indicate a like effect generally.

If, however, it be the goal of electrical supply to concentrate the production of power from fuel in great generating stations, the end is yet a long way off, measured by present results.

Great as has been the increase in the application of electric power during a score of years, and even during the past decade, the distributing lines have, as it were, merely skirted one side of the field of scattered prime movers. In the use of power for manufactures the increase of steam is the striking figure. Starting with 1880, about the date that electrical supply began, 2,185,458 horsepower of steam engines was used in manufactures, and in 1905 the corresponding figure was 10,828,111 horsepower, for the entire United States. During this quarter of a century the increase of steam power was thus 400 per cent, or the total was five times as great in the later as in the earlier year.

Besides the steam plants, gas and gasoline engines used in manufactures had an aggregate capacity of 289,514 horsepower, in 1905, bringing the total capacity of engines devoted to this purpose to 11,117,625 horsepower.

In 1905, 441,592 electric horsepower was rented for manufactures, or four per cent of the engine power used, but this electric power was 2.4 times the figure of 182,562 horsepower for 1890, the first year when the electric was reported.

The above figures do not include the 2.7 million horsepower in mines and quarries, per the census of 1902, the 0.8 million horsepower in custom flour, grist and saw mills, per the census of 1900, or the electric railways, light and power stations, and the steam railroads.

Coming to a single state, Massachusetts had steam engines of 690,467 horsepower, and gas and gasoline engines of 7,487 horsepower, a total of 697,954 engine horsepower employed in manufactures, in 1905, when 27,073 electric horsepower was rented for this purpose. This rented electric power is only about four per cent of the engine power, but it is to be noted that not all rented electric power is reported in connection with manufactures, for a single electrical supply system in Boston had 26,416 horsepower of motors connected, in the year last named.

While most of the broad field of power is not yet covered by electrical supply, a strong movement in this direction is underway, as shown by the general figures for a score of years, and by the results in some special instances.

Going back to 1887, the horsepower of electric motors connected to the large supply system at Boston was 250, but in 1908, the corresponding figure was 35,422 horsepower. Even in 1898, the combined capacity of electric motors connected to the two large supply systems of Boston, which have since been united, was only 9,194 horsepower, or twenty-three per cent of the power ten years later, in 1908.

Taking the next largest motor load in the state, the connected horsepower was eighteen, in 1887, while in 1898 it was 1,103, and in 1908, 6,435 horsepower. In this case the increase during the decade ending with 1908 was 483 per cent.

Considering all the central stations of the state except the municipal plants, the income from the sale of electric power was $517,300, in 1896, and $1,825,729, in 1908, so that the gain was 250 per cent in twelve years. Rapid as has been the rise of lighting income of these stations, the power income increased to twenty-two per cent of the lighting, in 1908, from 14 per cent in 1896.

While these general figures show the rapid advance of the electric power business, some particular systems have gone much further on these lines. The fact is that a number of central stations deliver nearly one-half of their commercial output, and a few much more than one-half, for power pur-

poses, not including electric railway loads. In one such instance the power sales of a central station amounted to 3,761,362 kilowatt-hours last year, and this energy was sixty-nine per cent of its total commercial sales. Another central station sold 1,030,725 kilowatt-hours for the operation of stationary motors, and this was seventy-one per cent of the output for commercial purposes. Power sales by a third station reached 1,894,874 kilowatt-hours during the year, or eighty-two per cent of all the energy delivered apart from street lighting. In each of the three stations just noted, the entire output was generated by steam power.

The above figures are from the records of ordinary electrical supply systems that began operations with merely lighting business, but have gradually developed a part of the field for the sale of power.

For transmission systems devoted mainly to the sale of energy in combination of steam and water power, the percentages of output and income that relate to sales for power purposes are often higher than those above named. This is due not to less use than is usual of electric lighting, but to the greater use for power induced by the low bulk rates.

ELECTRICALLY-DRIVEN ROLLING MILLS.

Before the introduction of the electric motor for driving rolling mills, the question of design was largely a matter of guesswork, and of profiting by successive errors and mistakes. This hit-or-miss policy was not conducive to efficiency and economy, or to uniformity or quality of the finished product.

With the steam-engine drive, there is no way of telling easily the work done at each pass. With electric-motor drive, on the other hand, the mill operator is able to see at a glance by his instruments the work done at each pass, and this fact has enabled the engineer to design the mill in such a way as to equalize the efforts, and so to avoid high power peaks, thereby decreasing the power of the prime mover and hence the first cost of installation and the cost of operation.

The elasticity or overload capacity of the electric motor is also very much in its favor, as it is characteristic for developing a uniform torque throughout its entire revolution, and independently of its speed of rotation. The steam engine, with a reduction of speed, develops correspondingly less energy; whereas, in rolling-mill work, the opposite should be the case, as the speed of the steel should be low, as it enters the rolls, and faster as it lengthens. This disadvantage of the steam engine can be overcome by a proper design of electric-motor drive. In the case of overload requirements, the motor can take more and more current from the line as it is required, even up to an overload of three times the normal capacity of the machine for the short time the extra power is required. When a motor-generator flywheel set is used, the steady horsepower supplied to the circuit usually varies from one-fifth to one-tenth the maximum output of the main motor.

Even with electric drive, however, it is not possible at first to design correctly the flywheel effect necessary to overcome the excessive loads which obtain in rolling-mill work. An example of how this was done, after an actual trial on the installation, was described by Mr. B. R. Shover in a paper on electric-motor applications in the Gary rolling mills, delivered last March before the American Institute of Electrical Engineers in New York. In the cases of the 6,000 and the 2,000-horsepower motors, at Gary, heavy cast-steel rims were attached to the rotor spiders, and these were made so as to be replaceable by rims of different weights. Of course the problems at the Gary Steel Works were nearly all of them entirely new, and practically no data were available.

The question of safety in operation is another point greatly in favor of the electric motor. With the steam drive, when a piece happens by accident to leave the rolls, which often occurs in reversing rolls, the engine is apt to race on account of the sudden drop in the load. Such an eventuality can be provided against in the case of the electric-motor drive by employing a controlling device (with motor-generator flywheel sets) which imposes a powerful and immediate braking effect on the motor when a predetermined speed is exceeded.

In spite of the claims by some of the adherents of steam-driven rolling mills, that the steam drive is more economical than electric drive (and this, by the way, is disputed by many rolling-mill experts), it is a significant fact that not only are most of the new mills being equipped with electric drive, but many of the older mills are scrapping their old steam-driven plant and substituting therefor the electric drive. In large mills where blast-furnace gas is available, the use of gas-engine generator sets will undoubtedly prove more economical than any steam-engine plant. This has been done successfully and economically at Gary and at many other places.

ELECTRIC LIGHTING FOR THE SMALLEST CONSUMERS.

In the "Electical Notes from Great Britain," which appear on other pages of this issue, will be found a reference to a flat-rate tariff scheme for electric installation and lighting which is being tried out in London, England. This scheme calls for free wiring of the exposed variety for apartments or houses of three or more rooms, and the free installation of tantalum lamps. The consumer pays six cents a week (on an average for the whole year) for each lamp, and furnishes his own renewals after the first lamps furnished by the electric-light company burn out. The six-cent-per-week charge thus covers installation and the charge for electric light.

While the above charge seems remarkably low, there seems no reason to doubt the genuineness of the promoters of the company, who are backed by responsible electrical interests. Similar attempts with carbon lamps and more expensive wiring have failed in the past, but this new scheme with high-efficiency lamps and cheap wiring seems destined to make a good bid for the business of the smallest consumers whom otherwise it would be impossible to interest in electric lighting. The experiment, for such it must be called at present, will be watched with interest.

Some Coming Notable Meetings of the American Institute of Electrical Engineers.

The regular monthly meeting for February of the American Institute of Electrical Engineers is scheduled to be held on Friday evening, February 11, at the Engineering Societies Building, New York city. W. Lee Campbell, of the Automatic Electric Company, Chicago, is expected to present a paper on "Modern Automatic Telephone Apparatus," illustrated by lantern slides and a working twenty-five-line section of an automatic telephone exchange designed for a capacity of 1000 lines.

A meeting of the Institute in co-operation with the American Society of Mechanical Engineers is to be held in Boston, Mass., on Wednesday, February 16, in the auditorium of the Boston City Club, 9 Beacon Street, Boston. Arrangements have been made for the presentation of the following papers: "The Applicability of Electrical Power to Industrial Establishments," by Dugald C. Jackson; "Central Stations, versus Isolated Plants for Textile Mills", by Charles T. Main; "The Supply of Electrical Power for Industrial Establishments from Central Stations", by R. S. Hale; "Illumination for Industrial Plants", by G. H. Stickney; "The Requirements for an Induction Motor from the User's point of View", by Walter S. Nye.

The annual dinner of the Institute will be given at the Hotel Astor, New York city, on Thursday, February 24, at 7:00 p. m. The guest of honor on that occasion will be Prof. Elihu Thomson, to whom the first Edison medal has just been awarded. It is intended to give this distinguished scientist a welcome befitting his great services to the Institute and the scientific world at large. President Stillwell has appointed the following dinner committee: Robert T. Lozier, chairman; George H. Guy, secretary; Theodore Beran, Maurice Coster, Minor M. Davis, George A. Hamilton, F. L. Hutchinson, T. C. Martin, A. S. McAllister, Wm. McClellan, H. W. Pope, F. A. Scheffler, Samuel Sheldon, Albert Spies, S. D. Sprong, and Arthur Williams. The committee is busily engaged in making its plans and arrangements. The speakers will include several men of prominence in the engineering profession. Special attention is being paid to decorations, music, and the souvenir menu. The price of the dinner, for which an excellent menu has been provided is $6.00, including wine, cigars and cigarettes. Applications for reservation of seats should be addressed to Ralph W. Pope, secretary of the Institute. As usual on these occasions, ladies will participate, and a total attendance of at least 500 or 600 is expected.

The regular March meeting of the Institute will be held in New York city on Friday, March 11, in coöperation with the American Institute of Mining Engineers. The following tentative programme has been arranged for this meeting: "Electric Mine Hoists", by D. B. Rushmore; "Electric Mine Hoists with Ilgner Motor-Generator Set", by R. R. Seeber; "Comparison of Electric and Compressed Air Drives for Mine Hoists", by K. A. Pauly; "Electric Mine Hoists", by W. Sykes.

A special meeting of the Institute will be held at Charlotte, N. C., on March 30 and 31 and April 1. Arrangements for the presentation of four papers have been completed. Plans for the entertainment features are rapidly maturing. The preliminary announcements in this journal, on page 172 of the issue of January 22, and page 237 of January 29, are being followed.

A meeting of the Institute under the auspices of the high-tension transmission committee will be held in San Francisco, Cal., on Thursday, April 21, 1910. Among the papers which will be presented at this meeting are the following: "The Economics of a General Power System", by John A. Britton; "The Developed High-Tension Network of a General Power System", by Paul M. Downing; "Hydroelectric Developments and Irrigation", by John Coffee Hays.

This array of important meetings is under the direct jurisdiction of the home officers of the Institute at New York and is entirely supplementary to the regular meetings of the numerous local sections and branches. It is an excellent manifestation of the broadening scope of Institute activities and of the growing tendency to co-operate with other engineering societies.

Electric Traction Lectures at the University of Minnesota.

On February 1st, Edward P. Burch, consulting engineer, Minneapolis, Minn., began a course of twelve lectures on "Electric Traction for Railway Trains" before the senior students in electrical engineering at the University of Minnesota. These lectures include the following subjects: History of electrical traction; modern steam locomotives; advantages of electric traction; electric systems available for traction; characteristics of railway locomotives; features of motor-car trains; electric railway motors; power required for trains; steam, gas and waterpower plants; transmission and contact lines; electrification of railways; work done to the year 1910.

Iowa Electrical Association Convention and Show.

The tenth annual convention of the Iowa Electrical Association and the annual meeting of the Iowa Street and Interurban Railway Association will be held jointly in Sioux City, Iowa, April 20 and 21.

It has been decided to hold an electrical show in Sioux City in conjunction with and under the auspices of the two associations during the conventions from April 20 to 24.

An Interesting Counterpart Agreement.

An interesting counterpart agreement has been entered into between the Hodge Electric and Manufacturing Company, of Kansas City, Mo., and E. D. McAllister and F. M. Bernadine, of Kansas City, Mo., and Frederic P. Vose of Chicago, Ill., as trustees to liquidate the indebtedness of the electric company to its creditors. It is expected that this trusteeship will avoid, if the creditors sanction it, the necessity and expenses incident to bankruptcy proceedings and afford to the creditors a greater portion of their indebtedness than would otherwise be the case.

"Commercial Day" Arrangements.

The "commercial day" programme committee of the National Electric Light Association met as the guests of H. M. Byllesby & Company, Chicago, on January 20 to discuss arrangements for the coming St. Louis convention. It was planned to have not over ten papers on the programme and of these several will discuss matters of greater moment than mere soliciting of new business and advertising of electric service. The past year has seen a decided advance in central-station commercial work and the men engaged in this work are taking a more active part in the larger affairs of central-station management. The final meeting of the committee is set for March 17.

Bion J. Arnold.

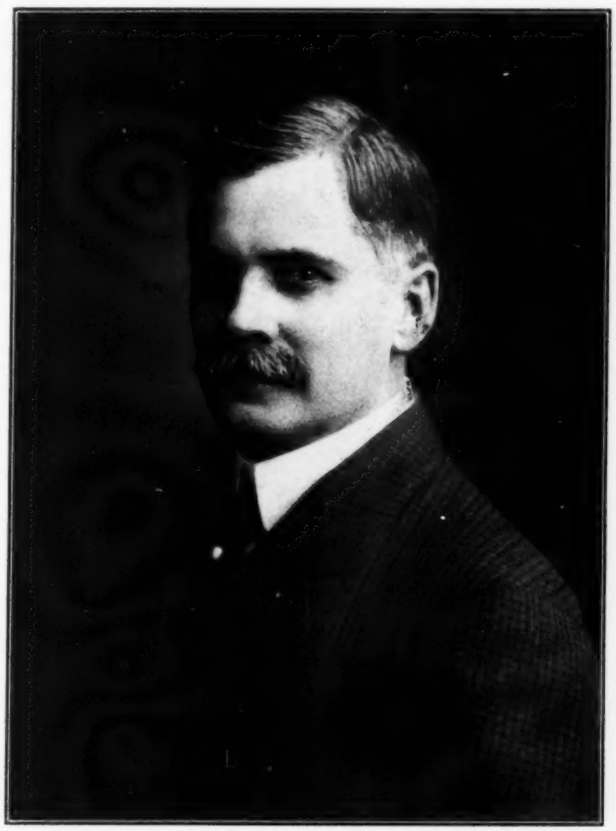
Bion J. Arnold, the well-known consulting electrical engineer of Chicago and New York, has just been engaged by the committee on local transportation of the Chicago City Council, with the approval of Mayor Busse, to prepare immediately actual working plans for an extensive system of subways in the Chicago business district.

Mr. Arnold some time ago submitted a report on the long-talked-of Chicago subway scheme to relieve the congested traction facilities in the "loop," and at the same time to accommodate the underground conduits and pipes of all the public utilities. Subsequent reports and plans have been prepared by the city's own engineering staff and others not officially connected with the municipality. These have been found impracticable, however, and after mature deliberation the municipal authorities have become convinced that Mr. Arnold is the only engineer conversant with the problem who could work out a practical subway plan and do it in a reasonable time.

The appointment of Mr. Arnold to this important work shows the high esteem in which he is held by public officials as well as those of public service corporations. It also marks another achievement in a most eventful career.

Mr. Arnold was born August 14, 1861, at Casnovia, near Grand Rapids, Mich. In 1864 the family moved to Ashland, Neb., where he received his early training on the farm and in the country schoolhouse. He early showed a marked inclination for mechanical devices and several times ran away from home to be the "engineer" of a threshing engine. At the age of twelve he built a steam engine, later a bicycle and at eighteen a working model locomotive. He spent a year at the University of Nebraska and completed his academic studies in 1884 at Hillsdale College in Michigan.

Then followed active employment as draftsman for the old E. P. Allis Company, of Milwaukee, Wis.; after this as chief engine designer for the Iowa Iron Works, of Dubuque, Iowa, and later as mechanical engineer for the Chicago Great Western Railway. A year was then spent in post-graduate study in electrical engineering at Cornell University, at the conclusion of which in 1889 Mr. Arnold became the engineer and agent of the Thomson-Houston Electric Company at St. Louis, Mo., and later the electrical engineer at the Chicago office. He continued with this company till after its merging into the General Electric Company. Before leaving the latter he achieved international reputation at the World's Columbian Exposition in Chicago, in 1893, for designing the Intramural Railway plant. This was the first electric elevated railway and its power-house contained the first direct-connected generating units.



BION J. ARNOLD,
Who Has Been Chosen to Design Chicago's Subway System.

Striking out on independent lines, Mr. Arnold entered the storage battery field, in which he had great faith, in spite of prevailing opinion. After many trials and reverses he came out with unshaken faith. Almost at the same time he developed his magnetic clutch for connecting any idle generator to the engine shaft. He built up an extensive practice in power house design as president of the Arnold Electric Power Station Company, which later became the Arnold Company. His design of the plant of the Chicago & Milwaukee Electric Railway was the first adaptation in railway service of high-tension transmission from a central power station to substations equipped with rotary converters and storage battery auxiliary.

Mr. Arnold's recent engineering work is quite well known. He has acted as consulting engineer for numerous power plants, electric railways, locomotive shops, irrigation and power transmission projects, and other works of the most varied character. He is an excellent organizer and keeps his staff, like himself, always in the lead of professional engineering practice. In the last few years Mr. Arnold has devoted himself largely to the solution of public-service problems of considerable magnitude. Among these is the rehabilitation of the Chicago traction lines, which is giving Chicago the finest street-car system in the world, and for which Mr. Arnold, as chairman and chief engineer of the Board of Supervising Engineers, is so largely responsible. In New York city, also, Mr. Arnold is doing much work for the Public Service Commission in improving the service in the subway and in the valuation of the entire traction systems.

Recognition of Mr. Arnold's services has won him many honors. Numerous collegiate degrees have been conferred on him; he was twice delegated to international electrical congresses; he was president of the American Institute of Electrical Engineers in 1903-04, and of the Western Society of Engineers in 1906. He is a member of several other engineering, scientific and educational societies and of a few clubs.

Plans for Another Subway Ready.

The New York City Public Service Commission has announced that construction of the Brooklyn part of what is known as the Centre Street subway system will begin in a few months.

New York Telephone Investigation.

The legislative committee which has been sitting from time to time in New York city questioned Union N. Bethell, vice-president of the New York Telephone Company last week. The committee is to report on the advisability of placing telephone and telegraph companies under the Public Service Commission.

Ephraim J. Page, counsel for the committee, asked Mr. Bethell about the various steps whereby the American Telephone and Telegraph Company and its subsidiary, the New York Telephone Company, secured control over the up-State Bell companies by transfer of stock and assumption of debts.

"In every case," said Mr. Bethell, "we got consents from 99 per cent. of the stockholders before the merger was completed."

Mr. Bethell fixed the time of the purchase from the Western Union of 18,000 shares of New York Telephone Company stock as the middle of September. "And what was the price, Mr. Bethell?" asked Mr. Page.

"That's the question which Mr. Vail, when he was examined here, excused himself from answering, I think," said Mr. Bethell. "But I will answer it. The price paid was 150."

"Do you know of any instance where local telephone service has been given for nothing in order to drive out competition?" asked Mr. Page.

"Never for nothing; that is not according to my orders," said Mr. Bethell.

"I suppose you wouldn't send out orders for rate cutting for that purpose, anyhow, would you?" asked Mr. Page.

"Oh, yes," Mr. Bethell admitted, "I have given orders for reductions in local rates when we have been hard pressed by competitors."

"And you have simultaneously raised rates in adjoining towns?"

"I don't remember any such instance."

Mr. Bethell said it was sincerely believed, especially in New York, that a single telephone system was better than two. He said that when there was talk hereabout of forming a competing company the applicants for a franchise went around buying signatures to their petition for 50 cents apiece. As for his company, he said that it had a charter from the State and from the Aldermen too.

Mr. Page asked him to give some idea as to the investment involved in the telephone properties in New York State controlled by the American Telephone and Telegraph Company. Mr. Bethell said to prepare such an estimate would take four or five months.

Assemblyman Merritt, a member of the committee, asked Mr. Bethell to explain why it should cost more to transmit a man's voice from Brooklyn to The Bronx than to transport his body. Mr. Bethell answered in a flash that the cases weren't parallel, for you had two wires all to yourself when you talked, but that when you travel in the subway you are a long way from being alone.

H. F. Thurber, the general manager of the New York Telephone Company, said the reason for a ten cent charge from Manhattan to Brooklyn was that there had to be a zone system, and that a zone system has to appear arbitrary somewhere and that point was between New York and Brooklyn. He said that the company tried to make its charges equitable between different districts.

This committee also investigated the rates which are at present charged for transmitting cable messages, believing these rates to be too high. George Gray Ward showed that the present rate of twenty-five cents per word is as low a charge as can be made. He stated that there is no combination between the Atlantic companies to maintain a uniform toll, and that while in the last ten years the operating expenses of cable companies have greatly increased, the use of code words and phrases, which are supplied gratis, has so increased within the same period as to minimize the cost of cable messages to a point far below a twenty-five cent rate.

"When it is borne in mind that ninety-eight per cent of the cable messages are in cipher code and each code word, as explained above, represents at least twenty plain words, it will be seen that cablegrams in code bring the rate down to less than two cents a word for the translated message.

"There is another very important thing to consider. Because of the difference in time between Europe and America the business hours common to both countries are only three or four. It is imperative that the cable companies shall have ample facilities to transmit with reasonable despatch all the business offered on both sides of the Atlantic during those hours.

"The amount expended by all cable companies for maintenance and repairs," continued Mr. Ward, "is enormous; the total sum is little realized by the public. For instance, it is costing the Commercial Cable Company over $70,000 a year to maintain a special seagoing repairing steamer at the wharf on the American side in readiness to put to sea at short notice, and in addition thereto a large amount is expended when the steamer puts to sea to repair a cable. Then, there is the expense of repairing the cables themselves. Sometimes a single break costs over $50,000 for repairs. On one occasion it cost the Commercial Cable Company $92,000 for a single repair.

"The twenty-five cent rate is a fair rate. It is no more than is necessary to pay operating expenses and to keep the plant in thorough repair and readiness to furnish the best possible service in point of regularity, accuracy and speed and to pay a very reasonable return on the money invested."

Chicago Electric Club.

The meeting of the Chicago Electric Club on Wednesday, February 2, was devoted to business. The reports of the retiring chairmen of the various committees were heard and several recommendations made.

The election of officers for the ensuing year took place and as there was no opposition ticket to the one presented by the nominating committee a member of this committee cast the ballot for the club. The names of the officers were given in these columns last week.

Following the election the incoming and retiring officers made brief addresses in which the work of the past year was highly commended.

On account of the remodeling of the Automobile Club quarters the Electric Club will meet for the next two or three weeks at the Kuntz-Remmler resturant, 303 Wabash Avenue.

Marconi in America.

William Marconi arrived in New York recently by the Cunarder Mauretania. From there he went to Cape Breton where he will superintend the completion of the new power station to replace that destroyed by fire.

He expects to have the station completed in a short time and to be able to transmit transatlantic messages by the beginning of April.

Commission News from New York.

It is set forth in the fifth annual report of the Water Supply Commission of the State of New York, just made public, that New York distances all other states in the gross total hydraulic power in use. The report says that New York was first to undertake a careful estimate of its waterpower resources with a view to a comprehensive public policy for their development.

The report states that the watersheds of the Hudson, Genesee and Raquette Rivers have been thoroughly examined and their water storage opportunities thoroughly examined and surveyed. Four great reservoir projects of water storage for power development and flood control have been located, surveyed, mapped and described from the point of probable costs and benefit in detail. These are the Sacandaga and Scroon Lake reservoirs on the Hudson drainage, the Portage reservoir on the Genesee, and the Tupper Lake reservoir on the Raquette.

The report makes special mention of the regulation of the waters of the Genesee by the construction of the Portage reservoir. The project would necessitate the expenditure of $4,518,000 for the construction of a dam and reservoir, if the dam were located at the site regarded as most favorable from an economic standpoint, but its construction as a business proposition rests upon the extent to which a market can be found for the 30,000 continuous horsepower which would be developed at the dam, and the extent to which the beneficiaries of flood prevention and the dilution of Rochester sewage can be assessed their due proportion of the cost. The report says that this reservoir should be the first attempted by the state if the proposed project can be successfully combined with the project for the regulation of the Genesee for the prevention of its floods and a proper part of the cost be met on this basis.

The Hudson River, the Commission says, is the most important internal power stream of the state, and on account of its size, population and developed industries, should receive the first attention in any system of state conservation that may be adopted. The Commission accordingly proposes the construction of a dam at Conklingville on the Sacandaga River, fifty miles north of Albany and six miles above the confluence of the Sacandaga and Hudson Rivers, to create a storage reservoir of twenty-nine billion cubic feet capacity and converting thirty miles of the present river valley into an artificial lake as large as Lake George. The primary object of this reservoir would be to provide a revenue to the state by affording relief from low water conditions to power producers on the Hudson. The market for power, which may be developed directly in connection with the Sacandaga dam, is found in Albany, Troy, Mechanicville, Fort Edward, Sandy Hill, Glens Falls, Utica, Schenectady and other communities within the zone of economical electrical transmission. The estimated cost of this reservoir, without power development, is $4,650,000, the total yearly fixed charges and maintenance $237,700, and the estimated annual gross earnings, $427,500, leaving an estimated annual net revenue to the state of $189,800.

The appointment of John N. Carlisle, of Jefferson County, to be a member of the Public Service Commission, Second District, has been confirmed by the state Senate. Commissioner Carlisle will succeed Thomas M. Osborne, of Auburn, resigned. Governor Hughes has reappointed George S. Decker, of New Hamburg, to succeed himself as a commissioner for the Second District, and Milo R. Maltbie, of New York city, to succeed himself as a commissioner from the First District.

In a recent decision the Public Service Commission, Second District, sustains the legality of the practice of street railroad companies in collecting a five-cent excess fare for passengers not holding tickets on interurban and other trips where tickets are required, and the issuance of redeemable receipts therefor. The decision was made in the complaint of James Morris, of Albion, N. Y., against the Buffalo, Lockport & Rochester Railway Company.

The proposition of the Second District Public Service Commission to establish a new standard for the measurement of gas, by which the gas supply shall conform to heating power requirements instead of as at present to illuminating power requirements, met with reluctant approval upon the part of the companies at a conference which was held recently at Albany, N. Y. Representatives of practically every gas company in the state of New York were present, and a number of gas engineers from outside the state.

The Public Service Commission, Second District, has authorized the Buffalo, Rochester & Pittsburg Railway Company to issue $1,277,000 in four and one-half per cent bonds. They are to be sold at not less than par and the proceeds are to be used in the payment of notes that were used for the construction of additions and betterments to the company's property.

In the annual report of the State Board of Tax Commissioners, just made public, much information is given on the workings of the special franchise tax law and the difficulties in the way of basing this special tax on the net earnings of public service corporations.

Westinghouse Storage Battery Plant Burned Down.

Fire on the morning of February 6 destroyed all but one of the buildings of the Boonton, N. J., plant of the Westinghouse Storage Battery Company. The loss is estimated at $240,000. The insurance on the buildings, machinery and stock in course of manufacture is said to be about $180,000.

When the fire was discovered it was burning on the third floor of the main building. Its origin is unknown. It was bitterly cold and there was a high wind blowing at the time the fire broke out. By the time the company's men and the fire department got to work the flames were sweeping through the plant. Only the power house which was to the windward of the fire and some distance away was saved.

About 200 men are thrown out of work. The plant was one of the mainstays of the village, and was always depended upon for work by many inhabitants. It was formerly owned by the General Storage Battery Company and recently purchased by the Westinghouse interests. It is thought it will be rebuilt at once.

Calendar Advertising.

The February calendar of the Denver Gas and Electric Company, Denver, Colo., has been received and is in keeping with those previously issued. This central station sends out a calendar for each month, taking this means of making a timely announcement as to its policy and business.

Annual Meeting of the Wood Preservers' Association.

The sixth annual meeting of the Wood Preservers' Association was held in Chicago, January 18, 19 and 20. The headquarters of the association were at the Auditorium Hotel. The attendance of the members of the association was much larger than was expected. There were probably between seventy-five and one hundred members and visitors present throughout the sessions of the convention.

The opening session of the convention was called to order on Tuesday morning by President Walter Beuhler, consulting engineer, Kettle Rivers Company, St. Louis, Mo., at 10:30 o'clock. A well arranged programme, covering subjects vitally interesting to wood preservers, was presented by C. D. Chanute, of the Chicago Tie Company, chairman of the program committee. After the appointment of several committees and the transaction of some routine business the meeting adjourned until 1:30 o'clock.

At the afternoon session the convention got down to the real business before it. One of the most interesting papers presented was that by Andrew Gibson, superintendent of timber preservation, Northern Pacific Railway Company, Brainerd, Minn., entitled "Economies of Cables, Electricity or Locomotives in Moving Materials at Plant." A short abstract of this paper follows:

The Brainerd plant of the Northern Pacific Railway Company began operation in September, 1907, and the power used to handle the retort cars around the yard and in the cylinders is an electric locomotive weighing ten tons, running at 250 volts, and using 200 amperes current at full load. The draw-bar pull is 5,000 pounds at 2.75 miles per hour, thirty inch gauge. The current for the locomotive is furnished by a generator of fifty kilowatts and is transmitted over a trolley line extending east through the shipping yard a distance of 2,500 feet, and west through the seasoning yard a distance of 2,500 feet, which is now being extended about 800 feet further. The grade on the narrow-gauge track is practically level, but the curvature runs up as high as twenty-four degrees. There has not been two dollars spent for repairs on this machine since it commenced work. With this class of power in a tie-treating yard the danger from fire is practically eliminated and there is not the trouble with freezing which would be the case if a steam engine or other engine requiring water were used. It is always ready for service without any dirt, smoke, or other objectionable features. The generator furnishing the current also furnishes current for lights throughout the yard and buildings.

The discussion of this paper was led by President Beuhler, who stated that the electric locomotive and trolley could be used successfully in an exclusively tie-treating plant, but that, in his opinion, it would not be desirable and perhaps, on account of the trolley, it would even be dangerous to handle heavy timbers and piling with the electric locomotive.

Mr. Gibson stated that with the electric locomotive the fire risk was reduced to a minimum, which is a very important factor in the conduct of a wood-preserving plant.

The next paper was by H. M. Rollins, superintendent of the T. & N. O. Wood Preserving Works, on the subject of the inflammability of treated timber. Mr. Rollins outlined the two processes of treating timber and made a comparison of the degree of inflammability of timber treated by the various processes. The substance of his paper follows:

The principal processes now used for treating timber are Burnettizing and creosoting. Burnettizing is a treatment with zinc chloride; creosoting is a treatment with creosote oil, or the dead oil of coal tar. There is some prejudice against the use of treated timbers due to the impression some have that treated timbers are more inflammable than untreated timbers. An investigation of the facts will remove any prejudice. Timbers treated by the Burnettizing process are much less inflamable than untreated timber. The zinc chloride used in this process is very deliquescent in its nature, absorbing very quickly moisture from the air, so that its presence in timber not only does not increase its inflammability, but on the other hand to a great extent fireproofs it; any attempt to burn timber treated with a solution of zinc chloride will quickly demonstrate that it is less inflammable than a similar piece untreated. Also, zinc chloride enters largely into the make-up of fire-proofing compounds, and a knowledge of the nature of zinc chloride is all sufficient to any one that its presence in timber does not increase its inflammability. Timber freshly treated with creosote oil is more inflammable than untreated material, but its degree of inflammability gradually decreases as it grows in age, each day reducing this property until after a certain length of time it is more inflammable than untreated material and finally reaches the point where very much heat is necessary to ignite it.

In the discussion of Mr. Rollins' paper a very practical test of the value of creosoted timber was mentioned, namely, that of the Batlimore fire several years ago. It is interesting to know that at that fire practically the only telegraph and telephone poles that were put in use after the fire were treated poles. The steel poles were warped so they could not be used and the untreated poles were burned up; the creosoted poles were merely charred by the fire and were put in use again.

Other subjects discussed at the afternoon session were "Advantage and Economy of Various Retort Doors," and "Precaution against Fire at Plants."

Both the morning and afternoon sessions on Wednesday were favored with the largest attendance of any day throughout the three days' convention.

The first paper to be read in the morning was entitled "Results Obtained by Treating with Crude Petroleum" by C. Marshall Taylor, in charge of the department of chemistry and tests, International Creosoting and Construction Company. The treatment of timber with crude oil is now being tested. It has not been possible as yet to formulate any definite results on this. One or two railroad companies are experimenting with this process to determine its commercial value. An abstract of Mr. Taylor's paper follows:

Heretofore it has been considered essential to have in the preservative medium an element that was either germicidal or antiseptic in its nature. This treatment, however, is dependent upon an entirely new conception of preservative, namely, the elimination of air or oxygen and moisture, and has for its basis the well-known fact that in order that fungi may thrive, there must be present three essential conditions, moisture, air or oxygen, and the proper temperature. Therefore, this crude oil treatment gets its impetus from the fact that it probably will be first a weather proofing agent toward the tie, inasmuch as the tie is thoroughly impregnated with the oil, and, secondly, that the fungi will not be able to thrive from the presence of any moisture which may have been left in timber previous to treatment, because of the absence of oxygen or air.

The discussion of Mr. Taylor's paper was led by Mr. Innes, of the Indiana Refining Company, which refines oil products, such as petroleum base and asphalt base products. Mr. Innes stated that his company had been conducting a series of experiments for the use of the residue or the liquid asphalt for the preservation of wood. Some very excellent results have been obtained. The crude oil process and the process of treating material with the residue of certain oil products are as yet experimental, however. Mr. Innes concurred with Mr. Taylor in the belief that the essential thing seems to be a thorough filling of the cells of the wood and then a thorough waterproofing of that wood. The secret working of the fungi makes them very dangerous. Material attacked by the wood-destroying fungi appears perfectly sound on the outside, but may be entirely decayed on the inside; thus telephone poles and supporting timbers, for instance, are likely to break off before there is any outward appearance of decay.

J. B. Card, superintendent of the Chicago Tie and Timber Preserving

Company, read a very interesting paper on the subject of "What Per Cent of Creosote Oil Can Be Withdrawn from Wood by Subsequent Vacuum?"

The discussion of this paper was rather spirited, due to the statement of a representative of the American Creosoting Company, Chicago, that his company could withdraw sixty per cent of the oil while other companies stated that they were unable to withdraw more than about fifteen per cent.

H. F. Weiss, of the Forest Products Laboratory, Madison, Wis., attended the afternoon session and was invited by President Buehler to address the convention and explain what the United States Forest Service was doing along the lines in which the wood preservers were specially interested.

Mr. Weiss then addressed the convention for about thirty minutes, describing, first of all, the building now being erected by the University of Wisconsin in which the research work is to be carried on for the more economical utilization of forest products. The technical staff, as well as all the materials, are furnished by the United States Forest Service. The laboratory will be one of the best equipped laboratories of its kind in the West, and will be ready for operation about May first. The technical work in the laboratory will be divided into six sections. One section deals with timber tests to ascertain the mechanical properties of treated and untreated timber. In the section of timber physics work will be conducted in the microscopic identification and analysis of various American woods. The section of wood distillation will experiment on various ethereal oils and other by-products derived from mill waste. The section of paper pulp will study the manufacture of various grades of paper from numerous American woods and from sawdust and shavings and other forms of mill waste. The wood-preserving section will be fully equipped for experiments with various preservatives. One very practical feature of the laboratory is the fungus pit. The object of this will be to cultivate various wood-destroying fungi. The laboratory now has a complete set of fungi, which it expects to grow in this pit. The most destructive fungus will then be inoculated into pieces of wood treated by various methods, and in that manner the durability of treated and untreated woods can be studied. The laboratory already has outlined about fifty problems to be experimented with to determine their practical solution.

F. J. Angier, superintendent of the wood-preserving department, C., B. & Q. R. R., read a paper on the proper grouping of timber for treatment. It may be interesting to know that the timber before being treated is divided with reference to the season in which it is cut, the different species of wood, the different varieties of the same wood, the kind of soil in which it is to be placed, also whether in wet and dry districts, the place it is to occupy in the track, whether main line or branch line, etc.

After the discussion of Mr. Angier's paper a technical paper was read by Mr. Newton on "Notes on Creosote Analysis."

Through the kindness of J B. Card the members and visitors attended an illustrated lecture given by Richard E. Follett, at the Chicago Athletic Club, Wednesday evening, the subject being the "Conservation of our Forests and Forest Life."

The only paper provided by the programme committee for Thursday morning was that by R. L. Allardyce, general superintendent of the International Creosoting and Construction Company, on the subject of the proper amount of various antiseptics for treating purposes. A general discussion followed the reading of the paper.

This closed the regular programme with the exception of the election of officers and selection of place of meeting. The following officers were elected: Walter Beuhler, St. Louis, Mo., president (re-elected); C. W. Berry, Laramie, Wyo., first vice-president; David Allerton, Madison, Ill., second vice-president; C. D. Chanute, Chicago, Ill., third vice-president; F. J. Angier, Galesburg, Ill., secretary-treasurer.

Chicago was selected as the next place of meeting. The entertainment committee arranged for a banquet at the Chicago Athletic Club on Thursday evening. This was a very enjoyable affair and brought the convention to a close.

Electrification in France.

The Compagnie des Chemins de Fer de l'Ouest having presented a scheme for the electrification of the lines running to Saint Germain and Argenteuil, France, at a cost of $12,200,000, including the generating station, the state railways administration has adopted it with two modifications set out in M. Chaigne's report on the state railways. The first modification refers to the underground station at Saint Lazare, estimated alone to cost $3,600,000, which is held to be unnecessary, the existing station being considered of a capacity sufficient for a much greater amount of traffic than is at present offering, and than would be offering were all the lines on the right bank of the Seine electrified. With regard to the second modification, while the Western Rys. scheme only contemplated the electrification of the line to Argenteuil and Saint Germain, the new one involves the electrification of all the lines on the right bank. The total cost is put at $13,400,000 for the electrification proper, including the generating stations, and $1,400,000 for road works. The expenditure will be spread over the years 1910 to 1914. A beginning of the works will be made next year, for which a credit of $400,000 will have to be provided.

Favors Electrification.

A hearing was given to the Boston Transit, Railroad, Harbor and Land and Metropolitan Park commissions upon their joint report on improvements of the metropolitan district, by the Committee on Metropolitan Affairs of Boston, recently.

Chairman George G. Crocker, who opened the hearing, stated that the features of this report, which is a report in part, are: the recommendations of the joint board as to electrification of the railroads which cater to the metropolitan district; the right of taking land by eminent domain for the construction of a trunk highway across the city and other construction problems.

Mr. Crocker said that the question of electrification resolves itself simply to an instruction of the railroads operating in the metropolitan district to pursue with vigor the study of the problem of electrifying their systems and to make a report to the joint board by Sept. 1. "I understand that there is no opposition on the part of the railroads in making this study," he said. "They have all received due notice. There is no question that the electrification of our railroad service would largely contribute to the comfort our citizens, whether passengers or the general public, now inconvenienced by noise, smoke and soot. There is no question that the problem of electrification is an exceedingly difficult one and has not been fully developed." No uniform method has yet been determined upon.

Toledo Section of the American Institute of Electrical Engineers.

The regular open monthly meeting of Toledo Section of the American Institute of Electrical Engineers held on February 4, at Toledo, Ohio, proved a pronounced success. A talk on "Electrical Inspection Regulations" by electrical inspector T. D. McColl, and a discussion of "Theatrical Electrical Inspection" by assistant city electrical inspector F. L. Lucas, were interesting features of the occasion.

Chicago Automobile Show.

The ninth annual Automobile Show of Chicago, conducted under the auspices of the National Association of Automobile Manufacturers, was opened to the public on Saturday afternoon, February 5, 1910, in the Coliseum, Coliseum Annex and First Regiment Armory, and judging from the attendance and the interest manifested by the visitors the present show promises to surpass that of any previous year.

Following the lines of other successful expositions of recent date the setting and decorations for the show are unique. The interior of all three connected buildings is made to resemble a wooded garden. Large trees are transplanted bodily, and the ceiling and galleries are decorated with attractively painted landscapes and leaves, behind which are concealed electric lights. The various exhibition spaces on the main floors are divided by trellis work and ornamental fences. The entire effect is to remind one of the attractions of touring the country.

The buildings are brilliantly lighted. Tungsten lamps are used for individual booth lighting, and the general illumination is accomplished by Excello flaming arc lamps in the centers and A-B inclosed carbon arc lamps under and above the galleries.

All available space is utilized for exhibition purposes, and on account of many of the exhibitors requiring more space than formerly few commercial vehicles are shown. As in past shows, the main floors of all three buildings and the basement of the Annex are used for exhibiting cars and the balconies of the Coliseum and Armory and the second floor of the Coliseum Annex for motorcycles and accessories.

Electric vehicles and electrical equipment for the lighting and ignition of gasoline cars play a prominent part in the show, various firms making large and comprehensive displays. A significant feature is the number of gasoline cars shown equipped with electric lights.

For the purpose of obtaining a maximum distance on a single charge, thus necessitating larger cells, many of the new models of electrics conform very closely to the general outlines of the gasoline roadster cars, thus allowing about three-fourths of the battery to be placed in the front and only one-fourth in the rear of the car and at the same time combining many of the advantages of the gasoline car with those of the electric, and making the car thoroughly a man's car.

The Anderson Electric Carriage Company, Detroit, Mich., is exhibiting two four-passenger broughams, one of these being artistically finished in two tones of gray. There are also on exhibition the 1910 model two-passenger coupé and victoria and a roadster with rumble seat and cape top.

The Babcock Electric Carriage Company, Buffalo, N. Y., is displaying a new model seven-passenger outside-drive town car, and also a two-passenger roadster, both of these machines very closely resembling gasoline cars in appearance. This company has also on exhibition a four-passenger coupé, a five-passenger coupé and a new type of victoria phæton.

The Baker Motor Vehicle Company, Cleveland, Ohio, is exhibiting a luxurious two-passenger coupé and a two-passenger victoria with the new shaft, bevel-gear drive. There is also exhibited an elegant four-seated coupé with extension front. The Ralph Temple Automobile Company, Chicago, Ill., is exhibiting a two-passenger runabout, and a two-passenger coupé in connection with the exhibit of the Baker Company.

The Columbia Motor Car Company, Hartford, Conn., has on exhibition among its gasoline cars a two-passenger 1910 model, landaulet. This car is a new product of the company and embodies many attractive and valuable features.

The General Vehicle Company, Long Island City, N. Y., although not maintaining an exhibit at the show, is represented there by C. P. Chrysler, western manager, who explains the advantages of the electric commercial vehicle.

The Rauch and Lang Carriage Company, Cleveland, Ohio, is making a very interesting display of electric vehicles which includes two four-passenger coupés, one gentleman's roadster, with wheel steer, and a new model victoria. The coupés have a double-chain drive from the countershaft which is driven by means of a "silent chain" by an eighty-volt, compound wound motor. This motor is used as a straight series motor on all speeds except last when it is used as a differential compound. All the cars are equipped with electric brakes.

The Studebaker Automobile Company, Chicago, Ill., has on exhibition its new type of four-passenger coupé and three-passenger victoria. The chassis of the coupé is so constructed that the body is entirely removable and another style body may be attached. The victoria as shown is equipped with a leather top and removable side curtains.

The Waverley Company, Indianapolis, Ind., is exhibiting five of its standard electric vehicles. The four-passenger coupé and three-passenger victoria shown are so constructed that either body may be removed and the other substituted. There is also shown an elegant four-passenger coupé with permanent body and a two-passenger gentleman's roadster with wheel steer and with or without rumble seat. All Waverley electrics are equipped with the new type K shaft drive and interlocking controller. A feature of this exhibit is a working model of the type K shaft and herring-bone gear drive with the interlocking controller.

The Woods Motor Vehicle Company, Chicago, Ill., makes a comprehensive display of its line of electric carriages which include its five-passenger victoria equipped with leather top, its luxurious five-passenger coupés trimmed in both leather and cloth and its convertible brougham which can be equipped with either a victoria or brougham body for summer or winter use.

ACCESSORIES.

The Apple Electric Company, Dayton, Ohio, exhibits a complete line of dynamos of five and ten ampere capacity, particularly adapted for electric ignition and low voltage lighting of automobile lamps. This company also is exhibiting its Apleo storage battery and has a rack upon which are mounted a number of electric lamps being furnished with current by Apleo dynamos and batteries.

The Connecticut Telephone and Electric Company, Meriden, Conn., is exhibiting a line of Connecticut four-cylinder magnetos and parts. An interesting feature of this exhibit is a stand equipped to represent the driver's seat of a car with all necessary connections made. In this way the actual working of the magneto is demonstrated.

The Diamond Rubber Company, Akron, Ohio, is making a comprehensive display of rubber goods which includes, raw rubber, rubber insulating material and a complete line of Diamond tires.

The Joseph Dixon Crucible Company,

Jersey City, N. J., is showing a line of graphite products principally for lubrication. There is also shown a sample board containing a line of graphite commutator brushes.

The Electric Storage Battery Company, Philadelphia, Pa., shows a large number of characteristic types of Exide vehicle batteries mounted in standard trays adapted for different electric vehicles. There is also shown a column of standard sizes of ignition batteries as arranged for various types of cars. The Hyray automobile light is shown in operation and the intensity of its rays demonstrated. A feature of the battery exhibit of this company is its Duplex ignition battery which contains two sets of cells, one to be used ordinarily and the other set for use in case of an emergency. There is also exhibited by this company two lead burning outfits for garage use, one portable and one stationary.

The Heinze Electric Company, Lowell, Mass., is making an interesting exhibit of Heinze type 1M low tension magnetos with a high tension distributer.

The National Carbon Company, Cleveland, Ohio, has a very interesting exhibit, which, aside from its extensive line of dry cells, running up to the No. 8 size, and a set of various sizes of Columbia multiple batteries, contains an ingenious testing board for testing at one time four different batteries and igniters. This board is provided with four timers connected to the ignition outfits and with means for determining the exact number and spacing of the sparks developed at any desired speed. The testing outfit as shown is adjusted for twenty-three miles per hour. An ammeter in each battery circuit reads the average current consumption.

The Remy Electric Company, Anderson, Ind., is exhibiting a complete line of its high tension alternating-current magnetos.

The Stromberg Motor Devices Manufacturing Company, Chicago, Ill., is showing a complete assortment of its carburetors. A feature of this exhibit is an exaggerated working model of a carburetor showing the details of construction and operation.

The United States Light and Heating Company, New York, N. Y., is showing a number of truck and vehicle batteries and also a complete line of lighting and ignition batteries for gasoline cars. There is also included in this exhibit a handsome sample board showing battery plates and connectors. A battery rheostat, lamps and trimmings are also shown.

Report of Wisconsin Committee on Water Power.

The report of two members of the special legislative committee on waterpowers, forestry and drainage, Senators Paul Husting and Henry Krumrey, just made shows that the amount of horsepower available on the twelve principal streams of the state of Wisconsin, namely, the Wisconsin, Fox, Wolf, Chippewa, Black, Menomonie, Peshtigo, Oconto, St. Croix, Rock, Flambeau and Milwaukee rivers is 827,900 horsepower, and of this amount 183,105 horsepower has been developed.

The following is taken from the report:

"Wisconsin is rich in its potential waterpowers. While there has been some development of these natural powers, it may be said that such development is still in its infancy. As was natural, the rivers in lower Wisconsin were first available for waterpower and for that reason show a larger percentage of development, but the rivers of Northern Wisconsin, affording the greatest waterpower possibilities, may be said to be scarcely touched."

The committee made exhaustive investigations of the cost of generation of electricity by waterpower and by steam plants. It found that to produce 200,000 horsepower it would require approximately 1,500,000 tons of coal per annum, which at $3.50 per ton makes an expenditure of $5,250,000 per annum. On the total possible development of 1,000,000 horsepower, 7,500,000 tons of coal, at a value of $26,250,000 per annum, would be saved.

The report continues as follows:

"The saving of coal thus shown is startling and yet the figures are given by one who should know and who is a recognized authority. But even if exaggerated, we cannot help but be impressed by the tremendous conservation of the coal supply which would thus result. Thus we find a two-fold advantage in the use and development of waterpower. First, a great saving in the cost of production of power, and secondly, the conservation of the coal for use and generation of power in communities less favored by nature than Wisconsin. It is not surprising that we awaken to the realization of what the utilization and conservation of our waterpowers mean to the state and nation. With the exhaustion in the coal supply already forecasted, we appreciate that but one source of power will be available, that of falling water. Not only have we begun to fear that the coal supply will be exhausted, but that the waterpower, like the coal fields, will be used for the benefit and profit of the few, instead of for the use and benefit of the many."

"The state should declare in unmistakable terms that the use of water in navigable streams and lakes for power developed under a franchise from the state is a public use; and all of the energy developed or undeveloped of the water in the navigable streams of the state is subject to the control of the state for the greatest public good."

The committee recommends the levying of ten per cent on the annual franchise value per horsepower. By annual franchise value is meant the difference in cost between the production of power by waterpower and the production of power by coal at the same place in like quantities and under like circumstances. It was also recommended that the state should fix the location, height, and general construction of the dam in order that the power may be developed to the highest potential efficiency, and that provisions should be made to prevent monopolization of power. M.

Flagging on Indiana Railways.

At a recent conference of Indiana traction men with the Railroad Commission, several amendments to rules for the operation of interurban cars in the state were adopted. The most important provides for the moving of interurban cars by a flagging system, when for any reason the telephone lines are all down, perhaps due to sleet, fire or a tree falling across the lines, cutting off communication.

The old rule provided that in absence of train orders the cars should take the nearest siding and remain there until officials could get word to them. The new rule provides that the cars may proceed by sending a flagman ahead and flag the train around all curves and obstructed points.

The Railroad Commission objected to the operation of cars on time table rights in such cases, hence the adoption of the flagging rule. S.

Electrical Notes From Great Britain.

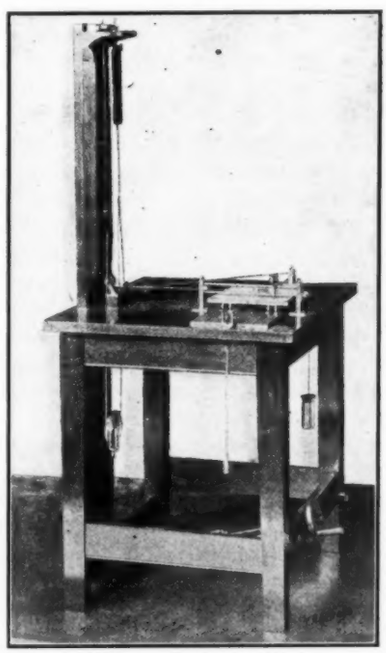
By Our British Correspondent.

At its first meeting after the Christmas vacation the Institution of Mechanical Engineers, London, had under attention two papers on hydroelectric subjects. W. R. Eckert, of Leland Stanford Junior University, California, described experiments made on the application of the Pitot tube to the testing of impulse water wheels. He mentioned that all the Pacific Coast power plants using impulse water wheels were provided with the apparatus necessary to measure the electrical output of the station, but few of them were provided with any means of determining the hydraulic input. Elaborate electrical switchboard readings were kept by station operators, but seldom was there any record of the quantity of water used to generate that power, by which the operating efficiency might become known. Without such a record it was impossible to tell whether the plant was being operated at its highest economy or not. Mr. Eckart described laboratory experiments that had been made with the Pitot tube in order to determine the practicability of the method under actual power-plant conditions, and the difficulties to be encountered in practice, when dealing with large discharges and high heads. As the result of the experiments the author arrived at the conclusion that the use of the Pitot tube and a contraction gauge for the determination of the discharge from large nozzles under high heads was not only practicable but accurate within the limits of experimental work of this nature by other methods. The apparatus is inexpensive, its portability renders it available for the testing of different plants.

At the same meeting C. W. Jordan read an interesting paper consisting partly of his own personal notes, and partly of material furnished by officials at Niagara Falls, of a visit paid by himself to the power plant of the Ontario Power Company.

R. M. Neilson has submitted to the Glasgow section of the Institution of Electrical Engineers an investigation as to the most economical vacuum in electric power stations employing steam turbines and cooling towers. The advantage which turbines derive from high vacuum was well known, and it was a relatively easy matter to determine what was the best vacuum at which to run a station or a unit with existing plant, but, he remarked, it was a more complicated problem to determine what was the most economical vacuum for which to design a new station, or a station extension. In order to arrive at a solution of the problem it was necessary to decide what items in the plant were appreciably affected in first cost by the vacuum, and what items of annual expenditure were appreciably influenced by it. In his investigation Mr. Neilson decided that the only items in the initial cost of the power station which were affected by vacuum to an extent worth taking numerically into consideration were the boiler plant and the condensing plant. He included in the annual charges which are affected by vacuum the coal only, in addition to the interest, depreciation, maintenance, etc., on the boiler and condensing plant. The many other items making up the total cost of the generation and delivery of a unit of electricity were considered to be affected by the vacuum to an extent not worth taking into account in the calculations. Many curves and data in tabular form appeared in the paper. In order to indicate the ground covered it should be stated that the station forming the subject of the investigation was one in which the main units consisted of three steam turbo-alternators, each rated at 3,000 kilowatts, but capable of carrying a considerable overload, although working most economically at or near their rated capacity. Water-tube boilers were assumed, and surface condensers and electrically-driven condenser auxiliaries. The condensing water was assumed to be cooled in natural cooling towers and repeatedly used, the small percentage lost in each cycle being continually made good. In addition to showing by his curves the most economical vacuum under these assumed conditions, it was the author's hope that the paper would indicate a basis for further investigations as to the best vacuum under other conditions.

Professor A. Schwartz, of Manchester, several of whose contributions to the proceedings of the Institution of Electrical Engineers have been so exhaustive that they have become important treatises on their subjects, read before the Manchester Section a paper on "The Testing of Rubber for Electrical Work." In introducing the matter he remarked that the physical properties of rubber for use in the arts are its elasticity, compressibility, extensibility, tenacity, flexibility, adhesiveness, resistance to certain chemical agents, impermeability to water, solubility in certain liquids, and high electrical resistance and dielectric strength. These properties are called for either singly or in various combinations in one or other of the many applications to which



RUBBER-TESTING MACHINE.

rubber is put in the electrical industry. Its insulating power is, however, in most cases of paramount importance. The professor said that, unfortunately, purely electrical tests did not afford satisfactory indications as to the permanence of those qualities of the rubber upon which its power of insulation depends, and we therefore had to go to the physical and chemical tests for information of this kind. The true function of the physical tests in this connection was to deal with effects, while that of the chemical tests was the determination of the causes which produced those effects. The physical were, therefore, pre-eminently the tests for the purchaser of the material; they

should also form the primary tests of the manufacturer, the chemical tests being supplementary to these either as confirmatory tests or for the elucidation of the causes of the defects indicated by them. As it was impossible to deal adequately with the varied and complex physical properties of rubber in a single paper, Professor Schwartz devoted himself exclusively to a consideration of the testing of rubber in tension, and to the hysteresis test in particular. The tests were carried out at the Manchester Municipal School of Technology and the results were shown by means of a large number of curves and tabulated data. A description was given of a machine designed by the author for the testing of rubber cable coverings. This device, however, lends itself quite readily to the testing of a variety of rubber articles, the details chiefly affected by the character of the work to be tested being the form of the test pieces and the character of the grips. The object of the machine is to effect the extension of the rubber by means of a load which is increased at a given rate until either a given load or a given extension is attained. When this point is reached the load is diminished at the given rate and the rubber is allowed to retract, the relation between the load and elongation being recorded automatically throughout the test. A general idea of the complete machine is conveyed by the illustration. Toward the end of his paper the professor said that in England, owing to the initiative of the Cable-Makers' Association, there was in vogue a partial system of standardization for rubber cable coverings, but that standardization only extended to certain particulars; thus, for each size of cable the minimum thickness of dielectric was fixed, and certain grades or quantities were established, the minimum insulation per mile being fixed for each of these grades. The individual manufacturers therefore had a free hand as to the ingredients they employed in the compounds, provided that the finished article complied with the foregoing conditions. The author suggested that a further standardization, based on the physical properties of the rubber, might prove advantageous in discriminating between "C. M. A." material and other material on the market which was sold as being "equal to C. M. A." Such a test would also enable the manufacturers to secure uniformity in the degree of vulcanization, in the quality of the rubber employed, and in the amount of mineral filling used.

The Leeds Section has been engaged upon the question that has been much discussed between electricity works engineers and tramway managers in towns where both departments are operated by the municipality taking supply for both purposes from one generating station. There are sixty-five towns in Great Britain having such combined stations, and the average price now charged to tramway departments by electricity supply departments is 2.754 cents per unit, the maximum being about 4.0 cents and the minimum 1.86 cents. H. E. Yerbury, who opened the question on this occasion, says that considering the low price now being charged by electric-supply departments for heating and general power purposes, it seems at first sight strange that a much higher price is invariably charged to tramway departments, notwithstanding the load factor and number of units per annum, comparing very favorably with any commercial enterprise. In his paper he put forward an equitable scheme for the purpose of discussion.

It is very satisfactory to note that a variety of new efforts are on foot now for securing the custom of the small lighting consumer. The low proportion of consumers to the total residents in most boroughs which operate municipal plants will not be very materially improved until the small man has been won over. This is especially so in some boroughs in which the population is composed almost entirely of what we call the working classes. There is every reason to believe that we are on the eve of an enlightened, aggressive movement in the right direction. It is of interest to mention here that the Liverpool City Council has adopted a suggestion of its electrical engineer, A. Bromley Holmes, that for a period of twelve months the following method of charging be adopted by way of experiment to induce small residential property to come on to the mains: For houses of not less than $100.00 per annum ratable value, a fixed quarterly payment of three per cent on that value, and a charge of two cents per unit measured by the meter. Another movement which will also be watched with great interest is one that has been inaugurated in one of the poorest districts of London during the past few weeks. A new company, known as the Fixed-Price Light Company, Ltd., has made arrangements in part of the area of the London Electric Supply Corporation under which it buys supply in bulk from that corporation and supplies it to tenants of very small houses at a fixed rental per lamp, which rental includes the cost of wiring the premises. Anything from three rooms and upwards the company will fit up and supply with tantalum lamps and lighting, at a rate of five cents per week per light between April and September, and seven cents per week per light from October to March. The consumer will furnish his own lamp renewals. The firm of Siemens Brothers is closely connected with the Fixed-Price company. There is every likelihood of the idea "taking on" in a number of places where the small tenant is a difficult problem.

Reference was made in these pages a short time ago to the electrically equipped rolling mills at the works of Dorman Long and Company, of Middlesbrough. Accumulating experience is demonstrating there the advantages of electricity in such work. During the night shift of twelve hours recently the twenty-eight-inch cogging mill cogged ninety-two ingots fourteen by twelve inches, down to both six and five-inch billets as required, in four hours, forty-one minutes actual cogging time, the total weight cogged being 105 tons. This is understood to be the fastest cogging plant in the North of England. The mill and electrical equipment (the latter supplied by the British Thomson Houston Company, Ltd.) were originally designed for an output of fifteen tons per hour, with a possibility of dealing with twenty-two and one-half tons per hour for two hours continuously if required. During the shift mentioned the output of the mill was twenty-two tons per hour every four and three-quarter hours continuously. In this mill an ingot of from twenty-two to twenty-five long hundredweights, fourteen by twelve inches, can be cogged down to a five-inch billet in 2.25 minutes.

The second Kelvin lecture to the Institution of Electrical Engineers was delivered on January 13th, in London, by Professor J. A. Ewing, Director of Naval Education, who took as the subject "The Work of Lord Kelvin in Telegraphy and Navigation."

ALBERT H. BRIDGE.

London, January 29, 1910.

THE NEW BERLIN-RUMMELSBURG POWER PLANT.

BY FRANK KOESTER.

The purpose of the Rummelsburg plant is to assist the Ober-Spree plant which is one of the Berlin central-stations for supplying light and power for municipal and private needs. The Obe-Spree plant supplies the eastern

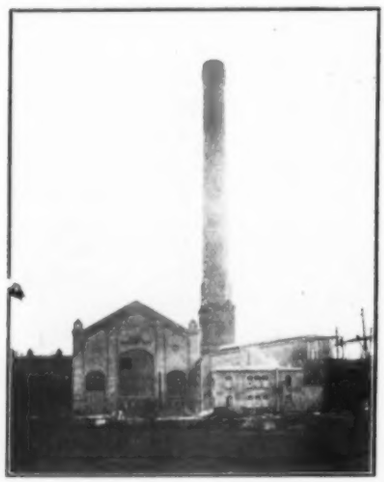


FIG. 1.—RUMMELSBURG PLANT.

section of the German capitol and has a total capacity of 31,800 kilowatts. This plant includes eight reciprocating engines and eight turbo-units, which are supplied by forty-four water-tube boilers with a total heating surface of

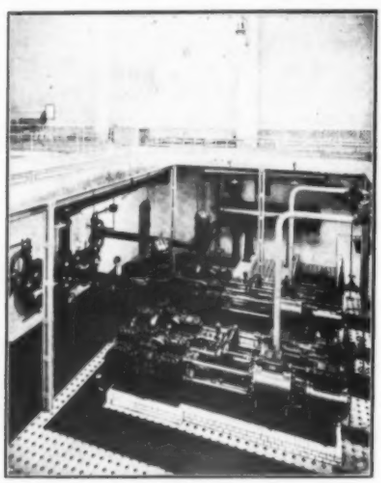


FIG. 3.—BOILER FEED PUMPS AT RUMMELSBURG PLANT.

153,700 square feet, or equal to about 15,000 horsepower, or less than one horsepower per kilowatt capacity, which is in itself evidence of the very economical operation for which the Berlin plants are noted.

What economy means in these Berlin plants is illustrated in the case of the Moabit plant belonging to this series of "Berlin Electricitats Werke" properties.

The engine in question is of the triple-expansion four-cylinder type much in favor on the continent of Europe, and consisting of one high-pressure, one intermediate and two low-pressure cylinders of the following diameters respectively: Fifty-one and one-fourth, sixty and one-eighth and seventy-two and seven-eighths inches, the stroke being sixty-six and seven-eighths inches and the number of revolutions eighty-three per minute. The engines operate under a pressure of twelve atmospheres (176.4 pounds) and

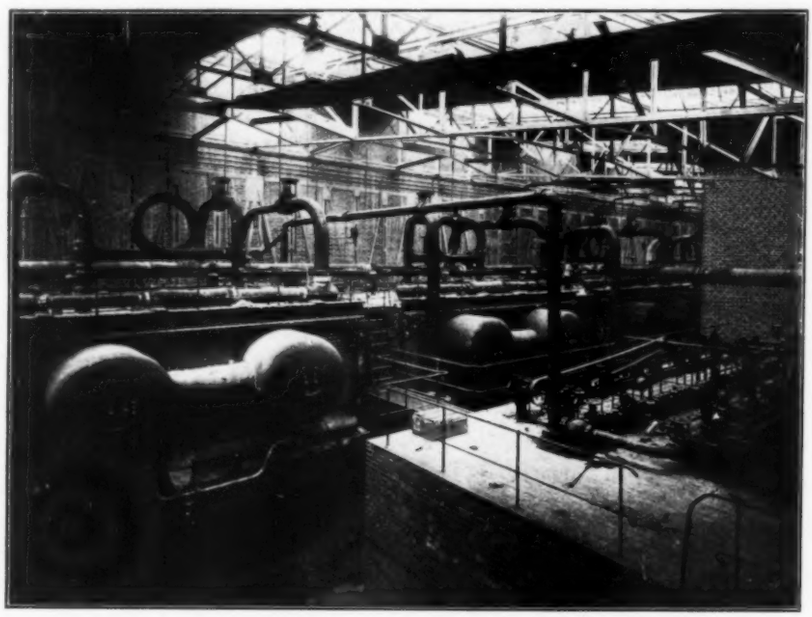


FIG. 2.—VIEW SHOWING REAR OF BOILERS AND ECONOMIZERS AT THE RUMMELSBURG PLANT.

a steam temperature of 572 degrees Fahrenheit developed as follows: Fifteen per cent cut-off, 3,450 indicated horsepower or 3,000 brake horsepower; twenty-three per cent cut-off, 4,470 indicated horsepower or 4,000 brake horsepower; thirty-two per cent cut-off, 5,490 indicated horsepower or 5,000 brake horsepower; fifty per cent cut-off, 6,500 indicated horsepower or 6,000 brake horsepower.

Tests made on these engines have shown, under actual operating conditions, and under normal full load, with pressure of 177 pounds to 188 pounds and temperature of 572 degrees Fahrenheit, an average steam consumption of 4.03 kilogrammes (8.806 pounds) per indicated-horsepower-hour. It must be specifically stated that these tests were not made under favorable selected conditions, but under ordinary operating conditions, and that engines of similar economy, in this plant as well as in other Berlin plants, are to be found, and they are probably the most economical prime movers in operation at the present time.

The new Rummelsburg plant consists of three main buildings adjoining each other. The boiler room, arranged for two rows of boilers and four chimneys, is 338 feet long by 130 feet wide, and will ultimately accommodate twenty-four boilers and eight economizers. The generating room, running parallel with the boiler house, is 246 feet long by eighty-two feet wide, and contains turbo-generators of 4,000-kilowatt units on the main floor, the condenser equipment being located in the basement. A thirty-ton electrically-operated crane spans the engine room. This crane is of lattice construction as usually found on the continent of Europe where engineering practice have little use for fish-bellied box-like structure.

Adjoining the engine room and parallel with it is the switch room which runs also for transformers and accumulators. It is 145 feet long by 52.5 feet wide.

In keeping with continental practice the various buildings are exceptionally well lighted and ventilated. The floors of the generating and pump room as well as of the switch room are of tile,

while glazed tile wainscoating is provided in the generating room, and all the walls of the pump room and even the foundations of the pumps and walls of the hot well are faced with light colored glazed tile in order to make any dirt conspicuous so that it can be promptly removed that the whole may be kept in a sanitary condition.

Owing to the peculiar shape of the plot the power house is distant about 900 feet from the river Spree from which the condenser water is drawn. The intake tunnel has an area of forty-one square feet and is about 1,200 feet in length. The discharge tunnel enters the river further down. In order to save on excavation the latter rests partly upon the intake tunnel, and, near the river, branches off and discharge into the same some 400 feet below the mouth of the intake tunnel, so that the discharge will not be drawn back into the intake.

During the construction of these tunnels and the foundations of buildings and chimneys, the difficulties from subsoil water were overcome by installing powerful pumps partly driven by electric motors and partly by portable engines, the subsoil water being in this manner kept twenty feet below the normal level for a period of four months. This practice is a common one in Germany and is accomplished by driving a number of wells alongside of the work to be done, the pumps drawing away the water faster than it can flow in through the soil, thus practically forming a valley in the subsoil water.

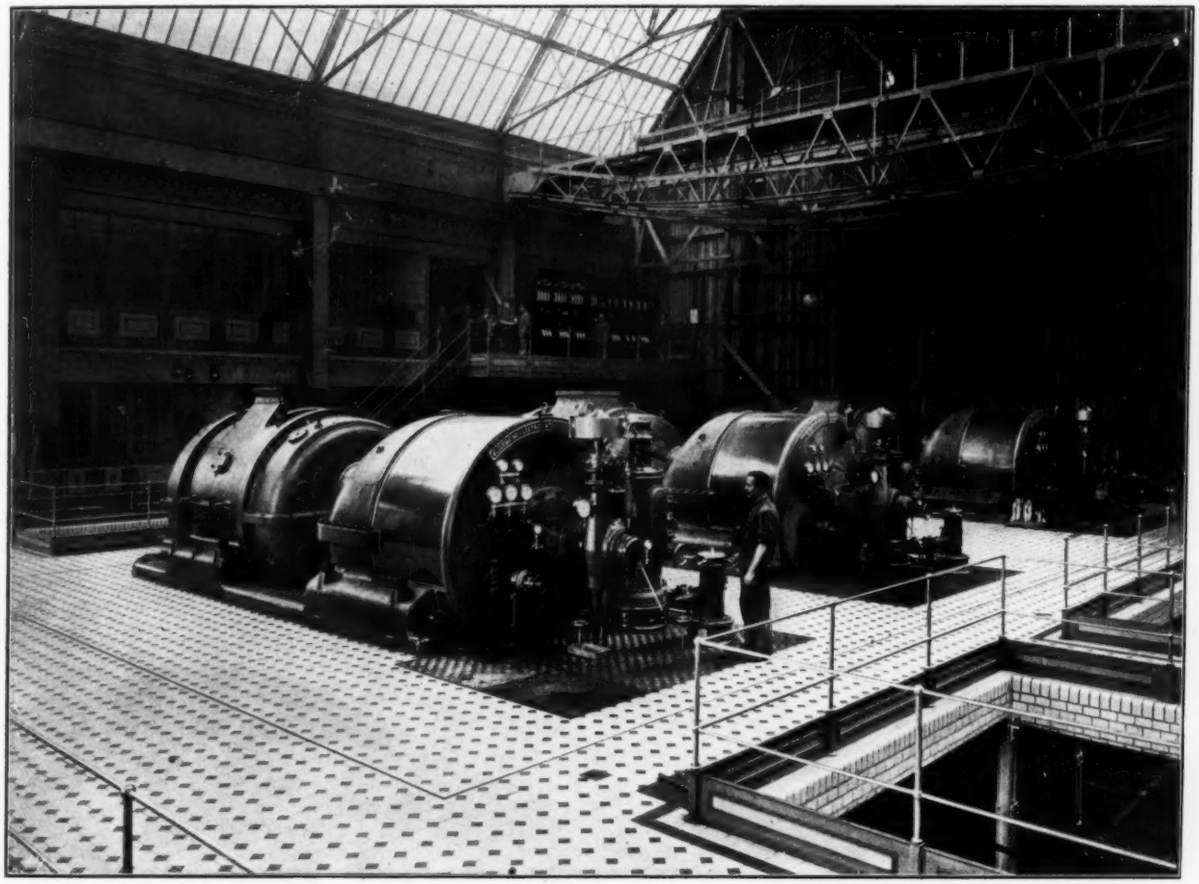


FIG. 4.—GENERAL VIEW OF THE GENERATING ROOM, RUMMELSBURG PLANT.

One of the most important features of all Berlin plants, including this Rummelsburg plant, is the coal-storage system employed, not so much in order to be on the safe side in case of strikes, but to take advantage of the lower freight rates during the summer season when the river Spree is open for navigation. Railroad connections are, of course, also provided for handling coal, machinery, etc. The facilities for handling coal are elaborate, this being done automatically so far as possible. The coal from the barges may be taken directly to the suspended bunkers in the boiler room or stored on the ground in any of the three coal traps for which provision is made. From these the coal may be brought to the bunkers, or, in the event of spontaneous combustion in one coal heap, the coal may be removed and placed on the other coal heaps. When coal comes in by rail it may be delivered directly to the bunkers or stored in the coal piles.

The coal is unloaded from the barges by means of grab buckets of one and three-fourths tons capacity each, elevated into a hopper of the coal tower from which hopper it is dropped into suspended dump buckets of three-fourths ton capacity operated on an endless cable transmission. The tower is equipped with a ninety-horsepower motor and the whole equipment is capable of handling fifty tons per hour, allowing ample time for shifting barges.

Three gantry cranes are employed for storing coal, one having a span of 155 feet and two of 125 feet each. The endless cable travels along three cranes and by means of trippers the suspended buckets are automatically dumped

at the points desired. As these cranes are of considerable height, and in order to prevent dust from scattering, the coal is dumped to the ground through vertical telescoping chutes which accommodate themselves to the different heights of the coal piles and travel along on the gantry-crane structure. Movable cranes with grab buckets operate on top of the gantry cranes in order to elevate coal from the coal piles and deliver it to the suspended buckets which, in turn, deliver the coal to the bunkers. These cranes are operated each by a sixty-horsepower motor, and are capable of handling fifty tons per hour.

The boilers are of the water-tube variety arranged two in a battery and in two rows, with one common firing aisle, each having a heating surface of 425 square metres, and as one square metre is equal to 10.76 square feet, one square metre of this type of boiler is practically equal to one horsepower, which is a common rating in American practice.

They are provided with mechanically operated chain-grate stokers and small-tube superheaters in the form of coils which are located above the water tubes and between the boiler drums. In the rear of the boilers the economizers are located and are not part of the boiler setting, the gases from the boilers passing beneath the floor, thence through the economizers to the chimney. These economizers, of which one serves for three boilers, have a heating surface of 8,600 square feet. The chimneys, of which one has been erected, are of the radial brick type having an inside diameter of 14.75 feet at the top, and are 262 feet high.

The ashes from the furnaces are carried away by cable transmission and buckets, similar to the coal-conveyor system, which runs in the boiler room basement under the firing aisle. The ashes are delivered to a crushing plant outside of the boiler room, the finer material having first been sifted through a grizzly screen. The ashes are crushed so as to pass through a screen of three-eighths of an inch mesh. From the crushing plant they are hoisted to a receiving bin from which they are dropped into railroad cars or may be loaded into barges. The complete outfit is capable of handling ten tons of ashes per hour.

The boiler feed pumps, of which there are two installed at present, are of the double duplex type having two high-pressure and two low-pressure steam cylinders and are capable of handling 7,000 cubic feet against a pressure of 250 pounds per square inch, the steam working pressure for the prime movers being 200 pounds. The pumps are provided with pressure regulators and start and stop automatically. The exhaust from these pumps passes through a horizontal closed feed-water heater which, as will be seen, is located close to the wall of the pump room.

The main steam piping is of lap-welded steel, and, wherever possible, expansion bends of large radius are employed. The boilers of each battery are interconnected by return loops as seen in the accompanying illustration. The mains lead from the boilers to the partition wall between the boiler and engine room, from where they drop and enter the basement of the engine room where the separators are located.

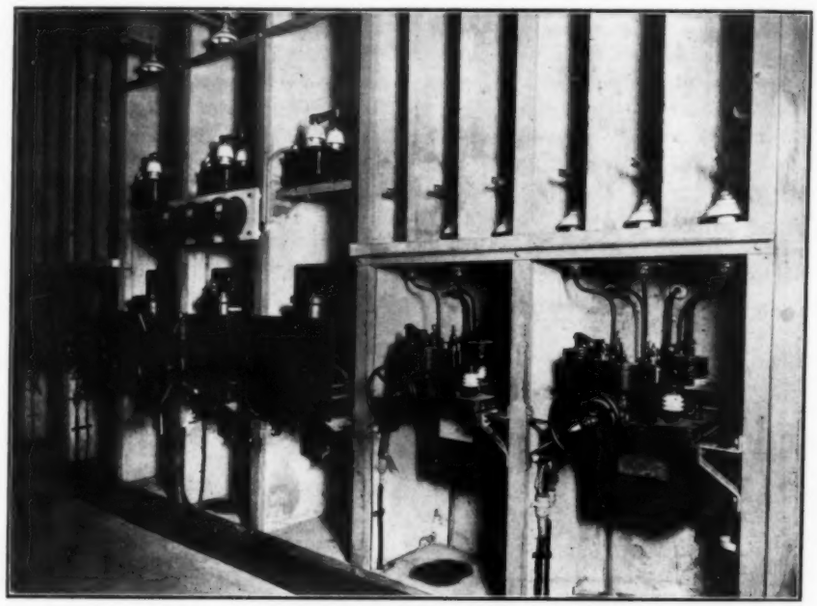


FIG. 5.—CIRCUIT BREAKERS, RUMMELSBURG PLANT.

FIG. 6.—MOTOR-GENERATOR SET, RUMMELSBURG PLANT.

The present equipment of the generating room consists of three 4,000-

kilowatt turbo-generators of the Allgemeine Electricitäts Gesellschaft (Berlin) make.

The condensers, which are of the surface type, are located between the foundation of the turbines. The water from the intake tunnel is forced through the condensers by means of motor-driven centrifugal pumps. The water of condensation is handled by wet vacuum pumps, also of the centrifugal type, and delivered to the hot well.

The turbo-generators are three-phase 6,000-volt of the Allgemeine Electricitäts Gesellschaft make. The feeders from these run through the basement to the switching room. The controlling and main switchboard is located on the gallery of the generating room as seen in the illustration. The switchboard equipment, circuit breakers, and other electrical devices are of the usual kind found in modern practice. Circuit breakers, disconnecting switches, measuring transfomers, etc., are located in separate groups of cells.

The current for supplying the various auxiliary motors, for operating oil switches, and for lighting purposes, is obtained by two motor-generator sets which may be seen in one of the illustrations. The starting rheostats are seen to the right of these sets of machines. A small storage battery is used with these motor-generator sets.

At the time of the inauguration of the system of central-stations for supplying the city of Berlin, and which was one of the very earliest installed in the history of electrical lighting, the 220-volt, three-wire system for lighting, and 550-volt for city railway service, was adopted and the newer central-station installations with the numerous substations had to conform with this practice. Therefore the current from the new Rummelsburg plant is also stepped down at the substations by transformers and converted by motor-generator sets.

It may be of interest to state that in conjunction with the numerous substations of the Berlin distributing system large storage batteries, having a total capacity of 18,600 kilowatts for a three-hours' discharge, are in use. This does not include eight booster batteries with a one-hour discharge capacity of 6,476 kilowatts.

The Rummelsburg plant is one of the most interesting new installations in Europe.

The Public Utility of Water Powers and Their Governmental Regulation.

The general legislative status of water powers and their relation to public utility are discussed in a report just issued by the United States Geological Survey of Water-Supply Paper No. 238. The authors are René Tavernier, chief engineer of the department of public works, Republic of France, and M. O. Leighton, chief hydrographer, United States Geological Survey. The report is timely, for waterpower development and its governmental regulation are now the subject of technical and popular discussion and have acquired a wider interest by reason of President Taft's recommendations relative to waterpower sites on the public lands.

The principal object of the paper is to show how the French and Swiss republics and the Kingdom of Italy are treating this problem in their political economy and to afford a means of comparing foreign practice with the procedure followed in this country. It is the opinion of the American author that in the adjustment of our waterpower problems it will be wise to observe the nature and drift of measures adopted by older countries, which were long ago obliged to consider the same questions that the people of the United States are facing at present. The paper shows that waterpower is a public utility and that the political and economic problems to which it has given rise have grown nearly to maturity within ten years. In this country the public utility feature has been hardly perceived and in consequence the legislative consideration of the question is concerned with a mature condition.

Mr. Tavernier's contributions consist, first, of a discussion of hydraulic power and its relation to irrigation, in which it is shown that there is or should be no necessary conflict in the use of water in the two utilities, but rather that waterpower development in arid regions goes along with and becomes part of irrigation develpment; second, of a discussion of French, Italian, and Swiss legislation relative to the development of waterpowers, which reviews the legislative practices on this question.

The gist of the whole matter, so far as European interpretation is concerned, is summed up in a statement in a proclamation of the director of public works of the Canton of Berne, Switzerland, which is quoted by M. Tavernier, as follows:

"It is the communes on which the law imposes the obligation of establishing and maintaining dikes and dams—the people who for years and centuries have had to bear the expense of maintaining the banks and protection works, without taking into consideration the great damage to which they are often subject on account of inundations—who should profit by the wealth that lies in the utilization of water powers * * * It is thus our purpose to have the country itself profit by the water powers located."

Mr. Leighton points out the fact that our present unpreparedness to meet the new questions involved in power development creates some disadvantages that are not altogether internal. In Europe waterpower development has become a national policy which cannot fail to attract great industries to the countries in which it is properly managed. There is a menace to American industrial leadership in the situation. The waterpower sites of Europe are close to the great markets of the world. Trade and production are entirely cosmopolitan. No one can be so confident of this country's industrial leadership as to assert that the wholesale development of large and cheap European water powers will not seriously affect our commercial welfare.

United States laws that relate either closely or remotely to waterpowers are discussed and quoted extensively, and legal and judicial opinions are either cited or quoted in full The statutes and regulations governing power development in the national forests are also given. The waterpower laws of Pennsylvania and New York are summarized, and the situation in several western states which have enacted water laws is discussed. Extensive quotations are made from the water law and the waterpower law recently passed in Oregon, which are cited as typical of other western laws.

The paper presents a general survey of the situation in its most important aspects and is a valuable contribution to the current discussion of the subject. A copy may be obtained free by applying to the Director of the Survey at Washington.

Great Northern to Use Telephones.

The Great Northern Railroad will use telephones for train dispatching over the entire main line.

CENTRAL-STATION PRACTICE

Transmission—Interior Wiring

The Storage Battery and Its Application to the Electric Vehicle.

At a recent meeting of the Brooklyn Company section of the National Electric Light Association, Julian Walton, storage battery and electric vehicle expert of the Edison Electric Illuminating Company, Brooklyn, N. Y., presented a very interesting paper, entitled "The Storage Battery and Its Application to the Electric Vehicle," as follows:

Considerable dissatisfaction exists among some users of electric vehicles, due to the fact that these vehicles have not met their expectations or for some reason have failed to prove profitable. This is due to a very large extent to inexperience on the part of the owner of the car and his failure to appreciate the necessity for the proper care of batteries. Recent investigations into the electric vehicle conditions in Brooklyn, have shown that ninety-five per cent of all cases of dissatisfaction have been due to the behavior of the storage batteries.

Before going into conditions as they have been found, it might be well to state that the campaign of education has to deal with far more than the proper methods of charging batteries. The need, more than anything else, is to impress thoroughly on the users of electric vehicles, the importance of keeping the electrolyte of their batteries free from impurities, as this is really the principal cause of battery failure. In diagnosing battery troubles, all failures are too apt to be attributed to overcharging or sulphating. In fact, there are few other well-known reasons for explaining the failure of batteries, these two causes being held responsible for buckling, growing, excessive shedding of active material, loss of capacity, etc.

Overcharging and abnormal sulphation are usually secondary evils which are caused by the introduction of impurities in the electrolyte.

In order to make the above statement clear to all, it will be necessary to cite the case of a new battery which, say, has a capacity sufficient to propel a vehicle thirty-five miles. This mileage has been accomplished and the owner of the vehicle grows to expect it each day from his battery. The specific gravity of the battery has to be equalized, and the water lost by evaporation replaced. This the attendant is ordered to do. He consults his instruction book and finds he must use distilled water, but he has none at hand. He reasons that hydrant water is good enough to drink and therefore it is good enough for the battery. In it goes, carrying with it many impurities, which begin their work on the plates, and down goes the capacity of the battery. The owner, knowing that previously the battery had been of sufficient capacity to propel the vehicle thirty-five miles, endeavors to do so again. He no longer has his original capacity, consequently, before he realizes it, he has discharged his battery below the 1.8 volt mark, and has formed this excessive and insoluble sulphate.

He comes back to the garage and accuses the attendant of not having charged the battery thoroughly, and orders him to give the battery a long overcharge. The instructions are carried out, but the owner is surprised to find that this has restored but little of the lost capacity. He then decides to continue overcharging and finally, though he does not appreciate the fact, these impurities become oxidized, if they happen to be of a chemical nature, and become a lead-attacking agent. This change in their nature may cause an increase in the capacity of the battery, but this is soon overcome by the rapid deteriorating effect produced. This is a simple illustration of the effect of an impurity in the electrolyte, and may seem somewhat exaggerated, but it is typical of the care which most vehicle batteries receive. Actual conditions as shown by investigations are even worse than this assumed case.

In most cases where it has been found that hydrant water has been used, those in charge when questioned have invariably replied that it is distilled water. This explains how vehicle owners are sometimes deceived. An instance is recorded of a concern operating a large number of electric vehicles who were advised by a so-called battery expert in their employ, that Brooklyn water was even better than distilled water for their batteries. The management has since complained of short life from its cells.

The following may serve to illustrate some of the results due to improper handling: A lady owning a runabout, ordered a new battery built to replace the one which had failed. The garage man building this battery assembled the plates in their cells ready for the developing charge. Instead of using proper lead connectors to connect the cells, copper wire was wrapped from one terminal post to the other throughout the entire battery. The acid attacked these wires and formed a heavy copper sulphate, which was carelessly allowed to fall into the cells. When inspected, the negative plates were found to be copper-plated with a heavy coat of pure metallic copper. When attention was called to this fact, the builder made the statement that copper could do no possible harm, as long as it remained on the negative plates. It has since been learned that this battery is rapidly losing capacity and requires an enormous amount of overcharge to bring it to a condition where a satisfactory mileage can be obtained.

A similar case was caused by the gross neglect of the manufacturer. The battery was equipped with copper connectors in such a way that the copper was carried into the electrolyte. This battery failed in two months, the cause being attributed by the manufacturer to improper charging by the garage attendants. This shows the misrepresentations sometimes resorted to by the manufacturers themselves.

A garage keeper caring for several batteries had realized the importance of using distilled water in them and for reasons of economy bought his water in large quantities. He purchased several carboys of the water, and in order to return the empty carboys and collect the deposit, had the water emptied into an old corroded gasoline drum. When a sample of the water was taken for analysis, it was found to be mud-colored, yet he was using it in all of his batteries, and was at a loss to explain why the plates deteriorated so rapidly and would not remain charged. It was also noted that an iron pipe was used for removing samples of acid from the cells for testing the specific gravity.

One case was found where acid of 1,500 specific gravity was used for replacing the water lost by evaporation, the attendant believing that he was using distilled water. This man could not understand why the specific gravity was so high.

In all probability these conditions are not alone confined to Brooklyn; in fact, a case was noted in England, where the purchaser received his battery, which had been shipped assembled, but without electrolyte. He had instructions to use pure sulphuric acid of 1.165 specific gravity. He had no sulphuric acid, so made use of common vinegar, and when the battery failed, he rushed it back to the factory, claiming that it was defective.

Knowing the above conditions exist, central stations should take immediate steps to remedy them, if the standard of the electric vehicle is to be raised. This necessitates a campaign of education. As a general rule, those who attend to batteries, especially the electric-vehicle type, have little conception of the treatment the batteries should receive. They ignore the instructions given by the manufacturer, or fail to comply with them for lack of sufficient knowledge of either electrical or chemical matters to appreciate what they mean. It is, therefore, useless to undertake to explain such matters in a technical manner, so that they may be impressed upon the garage man's mind. More satisfactory results can be obtained by imparting information by means of simple, but forcible illustrations, tending to show the importance of keeping the batteries clean and the electrolyte as free as possible from impurities, either chemical or metallic.

Very frequently plates going through the washing process are carelessly handled and set on concrete to dry. This concrete contains an abundance of iron and other impurities which plates will pick up and carry back to the cells. A good method to demonstrate this would be as follows: Take a sample of acid which tests free from iron; place a clean, dry wood-separator on the concrete floor, and pour some of the acid upon it; also pour some of the acid directly on the concrete floor. Then by applying any iron test, it can readily be seen that there is no iron present in the acid on the wood-separator, while the dense discoloration of that on the concrete floor will clearly show the presence of iron. A simple demonstration of this kind invariably leads to a better understanding of the care necessary for the proper handling of batteries and plates.

Another simple and effective method of demonstrating the importance of keeping foreign metals and their oxides or sulphates from entering into the batteries, is to take any two dissimilar metals, or preferably any metal common around the place, and a clean piece of lead. Place the two on a board and drop a few drops of sulphuric acid between them, and by means of a low-reading voltmeter show the difference of potential, and explain that this is what takes place in the cells. Caution users to be careful with burning irons, and not allow any foreign metal to come in contact with the plates of electrolyte. Instances have been recorded where iron tweezers have been used for removing foreign particles from a cell, and also where a battery engineer from one of the large battery works used his pocket knife to scrape sulphate from battery plates, also to test their hardness.

These remarks will apply to storage batteries in any class of work. Central-station batteries are in some instances neglected fully as much as the vehicle battery. Manufacturers should co-operate with one another and standardize their instructions. In many instances the manufacturer advocates the use of distilled water to prevent the introduction of impurities into the electrolyte; yet one vehicle-manufacturing concern advises the washing of batteries with a soda or ammonia solution!

An instance may be cited of a man who, in his endeavor to find enlightenment about the storage battery, had consulted a very old textbook, and was actually adding to his batteries sodium compounds, to prevent sulphating. Another case was that of an undertaker who thought he could improve his batteries by adding embalming fluid to the electrolyte.

Vehicle manufacturers should also pay as much attention to the battery requisite in the design of their vehicles as to the vehicles themselves. More attention should be paid to the discharge rates under which the battery works best. The curve (Fig. 1) will serve to illustrate how the battery is abused in this respect.

These data are taken from the actual working of one of the late model vehicles. The entire machine, just previous to the est was thoroughly overhauled and put in first class condition. Here the manufacturer adapted a battery to his vehicle which was called upon to do its work at a rate far in excess of that claimed by its manufacturers, to be consistent or efficient. Owing to conditions under which vehicles have to operate, it is impossible to determine a constant or even maximum rate at which a battery will have to deliver its energy. By giving the battery more consideration as a part of the equipment in the design of the vehicle, these conditions can no doubt be improved.

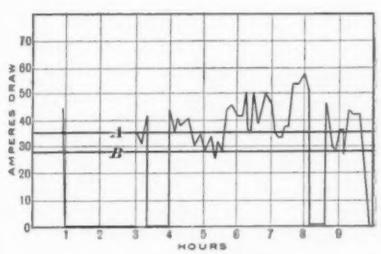


FIG. 1—DISCHARGE CURVE OF OVERWORKED BATTERY.—*A*, NORMAL DISCHARGE RATE OF BATTERY; *B*, AMPERES DRAW CLAIMED BY MANUFACTURER.

Some battery manufacturers have decreased the number of cells per battery, without increasing their ampere-hour capacity. When the vehicle is intended for high speed service, the horsepower required will be the same as it is in the forty-four-cell equipment; consequently the watts required being the same in the two equipments, the ampere discharge rates will be inversely proportional to the number of cells. As the forty-four-cell battery from which the data for the curve (Fig. 1) were obtained shows excessive dis-

charge rates, it can therefore be readily understood that the battery with a lower number of cells would be discharged at a dangerously high rate. Pleasure vehicles are frequently equipped with a battery which has a normal, or four-hour discharge rate of from twenty-eight to thirty-five amperes. These vehicles when operated on high speeds actually draw from seventy-five to 120 amperes from the battery.

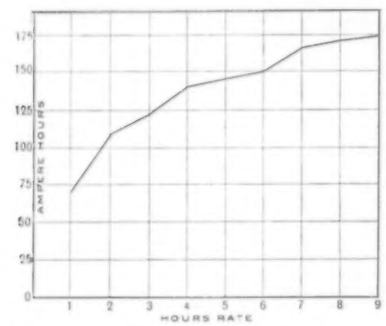


FIG. 2.—SHOWING REDUCTION IN CAPACITY OF OVERWORKED BATTERY.

Besides the extra wear and tear produced by these abnormal discharge rates, the curve (Fig. 2) shows how the total capacity is reduced.

Manufacturers should lay stress on the fact that a battery must not be discharged below 1.8 volts per cell, rather than claiming and advertising their vehicles to cover a certain number of miles per charge. No doubt low-discharge voltages are responsible for a great deal of loss of capacity in the vehicle battery. A battery may receive the best attention as far as charging and maintaining its electrolyte pure are concerned, but discharge this battery below 1.8 volts per cell and it may lose from ten to thirty-five per cent of its original capacity. This is due to the fact that an insoluble sulphate is formed after the cells are discharged below this point, and no subsequent overcharges will decompose this sulphate or restore the lost capacity.

If vehicle manufacturers insist upon claiming a maximum mileage for their vehicles, they should thoroughly advise the operator and familiarize him with all conditions which are liable to alter or prevent vehicles from accomplishing this maximum mileage, such as soft roads, hills or grades, soft asphalt and largely temperatures.

In conclusion, it might be well to correct any impression that might have been formed that the storage battery is a delicate piece of apparatus or one which requires constant or expert attention. In reality, there are few, if any, electrical or mechanical machines which will do their work as effectively and require as little attention as the storage battery. It responds automatically to its lightest or heaviest loads.

Pay attention to its details and give it systematic attention, and the dissatisfaction which now exists will be eliminated.

Third Avenue Reorganization.

A pamphlet published in connection with the recent hearing of the Third Avenue Railway before the New York Public Service Commission, gives in tabulated from the testimony of Henry Floy, consulting engineer, of New York city, who appeared before the commission.

Mr. Floy has divided the accounts of the company into three groups, the estimated cost of reproduction, the contingent expenses included in reproduction and the development expenses. The first of these, the total cost of reproduction, he estimates at $46,499,805.

The incidental expenses properly attributable to construction, would, he states, extend over a period of at least two years and amount to not less than fifteen per cent. Development expenses would amount to approximately twenty-five per cent. Calculating on a basis of $46,500,000, the total cost of reproduction by a new concern would be at least $58,125,000. It should be remembered that this estimate makes no allowances for franchises of the Third Avenue company or for loss involved in changing from horse to cable power and again to electricity.

Electric Power From Coke Ovens.

An electric generating station, to utilize the waste heat from coke ovens, has recently been built at Bankfoot, Durham, England. The equipment includes two Parsons turbines driving machines which feed into the main distributing system. It is understood that this is one of a number of similar plants installed or contemplated in the county of Durham, where there are quite a large number of coke ovens available for the same purpose.

Central Stations and the Electric Vehicle.

The relation of the central station to the electric-automobile industry is one of mutual interest, for the former can derive from electric-vehicle battery charging a highly remunerative source of income, coming as it usually does in off-peak hours, while the makers of electric vehicles will find it much to their advantage to have the central-station men as their allies in effecting sales and in educating the public to the proper use of the electrical equipment of the electromobile.

The following letters from central-station men show some experiences in this connection:

ROCHESTER (N. Y.) RAILWAY AND LIGHT COMPANY.

"We have in operation for our own work nine trucks, varying in capacity from 1,000 pounds to five tons. These wagons operated every day throughout the month of January without difficulty, although the weather bureau records show a precipitation of twenty-three inches of snow during the month.

"Following are the sales for the month of January for the years 1906, 1907, 1908 and 1909, together with the sales for the month of July for the same years:

JANUARY.		JULY.	
1906	$ 781.22	1906	$1,264.23
1907	1,116.30	1907	1,797.08
1908	1,431.74	1908	1,851.69
1909	1,876.58	1909	1,930.42

"These figures show the very marked increase in the use of the electric vehicle in the winter. The use of the coupé top and storm front has been largely responsible for this result."

ROCKFORD (ILL.) ELECTRIC COMPANY.

"We have about 140 electric pleasure vehicles in Rockford, practically all of which have been purchased within the last four years.

"There will be two exclusively electric garages opened here this spring which will materially aid the growth of the electric-vehicle business.

"The nature of charging, equipment, rates, etc., remain unchanged since the last résumé you had on the automobile situation."

UNION ELECTRIC COMPANY, DUBUQUE, IA.

"At this time the electric-vehicle equipment in Dubuque consists of three wagons or trucks operated by a brewing company, and a runabout by one of our residential customers. We have spent little of our idle time or feeble energy

on the storage battery game for the reason that we are surrounded by hills of such magnitude and beauty that this section is often referred to as the "Switzerland of America."

"Our street car lines navigate ten per cent and twelve per cent grades but the automobile industry will never thrive as it requires a most powerful gasoline driven outfit to go over the hills, and electrics must confine themselves to the small area constituting the level section of the city."

UNION ELECTRIC LIGHT AND POWER COMPANY, ST. LOUIS, MO.

"About three years ago, we realized that the electric-vehicle load was a valuable one and one well worth systematic effort to secure. At that time there were approximately thirty-five electrics of all description in the city; but twelve of these were pleasure cars, but two electric vehicle manufacturers were represented in this city by agents—one very indifferent electric garage was in operation—competent electric labor was almost unknown. We erected an exclusive electric garage that has a capacity of approximately eighty machines; took the agency for the Rauch and Lang and Studebaker electrics and placed the garage in the care of experts. In three short years the number of electrics have been increased to over three hundred. There are eight agents selling ten different makes of electric vehicles. In our garage are kept the demonstrating cars of three makes other than those we sell, which is very flattering, as it shows the confidence that the selling agents have in our absolute impartiality in the care of electrics of all kinds. There are about sixty electric pleasure cars kept on rectifiers scattered throughout the city. We care for approximately seventy-five cars in our own garage. There are now in operation five electric-automobile garages and the business is now on a substantial basis that would not have been reached in years had it not been for the thorough way in which we looked after it. So much for the growth of the business up to this time.

"As to the method of increasing this business: The writer has visited many cities where the electric machine is more or less popular and has spent days and nights in going over the garages in these cities. In many of them the battery abuse that is tolerated is simply criminal. Records were found to be kept in a very sloppy way and in many cases not kept at all. I was surprised to find that individual cell, volt and gravity readings were almost entirely neglected. I firmly believe that the most important method to be pursued to increase the electric automobile business is for the central-station to pay more attention to the methods used in the different garages and to impress on the managers the dire importance of proper battery attention given. Without this the electric machine can not be made a success for the reason that the battery maintenance runs to such a point that the vehicle becomes uneconomical, whereas economy is the strongest hold of the electric vehicle. In cities such as ours where the central station maintains an electric garage it is comparatively easy for the reason that if a high standard of service is maintained in the central-station garage, other garages are obliged to give the same grade of service or they cannot live long, for the owner of the electric vehicle by comparison will quickly learn wherein this or that garage is deficient. In cities less fortunate, however, a different plan must be pursued. The electric company at Dayton, Ohio, for instance, is trying to work out a plan whereby it has an electric-vehicle expert on the field; he keeps in touch with the owners of electric vehicles and gives them expert opinion free of charge whenever anything goes wrong with a car or battery. The first plan has been worked out and proven satisfactory. The second plan is yet undeveloped. Just what results will be obtained are problematical. The nature of equipment for the two different plans is self evident. If the first is pursued, the central station should have a garage second to none in the city. Its men should be experts in the true sense of the word and its records should be a model for other garages to copy. In case the second plan is followed the vehicle expert should be provided with a small repair shop and battery room where intelligent recommendations should be made after the proper physical tests have been made on the battery and machine in trouble.

"Concerning the probable future of this department of a central station in our particular case, it is particularly bright. Within three years we have filled the capacity of our present garage and are just commencing the erection of an exclusive electric truck garage in the business section of the city, and furthermore have in contemplation at least one larger and more thoroughly up-to-date garage close to the better residence section of the city. The department is on a firm financial basis, being in every way self-supporting."

GROUP OF ELECTRIC WAGONS RECENTLY DELIVERED TO THE ROCHESTER RAILWAY AND LIGHT COMPANY.

Receiver Asked for Chicago & Southern Traction.

A bill asking for a receiver for the Chicago & Southern Traction Company has been filed in the Circuit Court. The company has seventy-one and one-half miles of trackage, $2,500,000 stock outstanding and an equal amount of mortgage bonds. The main line runs to Kankakee.

The Functions of the Industrial Chemist.

In a paper read before the recent convention of the American Chemical Society, Arthur D. Little, a Boston (Mass.) engineering chemist, defined the functions of the industrial chemist as follows:

The combustion of coal is a typical chemical process. The selection of the most efficient coal and the determination of the conditions necessary for its most efficient combustion are essentially chemical problems. Chemical problems also are those arising in the manufacture of produced and illuminating gas, their utilization in gas engines, the development of power from the waste gases of the blast furnace, the adaptation of conditions to the proper handling and burning of peat, lignite and waste coal, the thermometric exploration of coal piles to forestall spontaneous combustion, smoke abatement, the control and improvement of fireroom conditions by draft regulation, flue-gas analysis, temperature measurements and even the placing of firemen on the bonus basis. Taking power-plant practice and the conditions of coal purchase as they stand, the properly equipped chemist should be able to increase the efficiency of power production from five to thirty per cent.

The analysis of boiler compounds as an end in itself presents little to excite enthusiasm, but when such analyses are made the means of saving $3,600 a year in the power plants of a single company they take on a new and larger aspect, not only in the mind of the chemist, but in the mind of the chemist's client.

The chemist who attacks the problems of power production will not hesitate to go outside the laboratory and take his property wherever he finds it. He will conduct boiler and engine tests, study the efficiency of grates and stokers, familiarize himself with the marvelous promise of the low-pressure turbine as an agent in efficient power production. While straining every resource of his science to produce steam economically by the combustion of coal, is it common sense for the chemist to stop there in ignorance of the fact that the efficiency of that steam can be increased at once by from twenty-five to one hundred per cent by coupling a turbine to the exhaust?

The distribution of power supplies problems no less directly within the province of the industrial chemist. He may begin with the analysis of lubricating oils. He proves his own inefficiency if he stops there. He must inform himself regarding the market prices of oils used elsewhere for similar service, the adaptability of the oils in question to application to the bearing by soaked waste, sigh feeds, or gravity cups. He must be prepared to interpret his analysis in terms of practice, and to follow the oil through the plant in order to prescribe conditions which shall keep down waste. There are few plants in which the industrial chemist working along legitimate lines cannot save from twenty to sixty per cent of the entire lubrication account, while the oil analyst has to his credit merely a few figures which his client probably fails to understand.

The efficiency and life of bearing metals varies over an extraordinarily wide range. Some are merely the refuse from type foundries; others are so carefully adapted in their composition to the requirements of particular service as to show an efficiency fifteen times or more as great as that of inferior material. Here again the mere analysis means little, the practical question is "Which is the more efficient metal under the conditions imposed by practice?"

Much more might be said regarding the opportunity before the chemist when any material concerned in power transmission is the subject of his study, whether it be leather, rubber or canvas belting, belt dressings, insulating material, trolley wire, trolley cars or trolley wheels. In every case it is within his power to create new standards of efficiency.

Southern Power Company's Expansion.

The Southern Power Company of Charlotte, N. C., announces that its newest hydroelectric developments at Ninety-nine Islands, seven miles from Blacksburg, S. C., on the Congaree River, will be put in operation within ninety days, adding 24,000 horsepower of electricity to the 80,000 horsepower already being produced at the other stations of the company. The powerhouse is now being completed at the new plant and two of the generators to be used have already been shipped.

The Southern company has just awarded contracts for the machinery to be used in its auxiliary plant at Greenville, S. C. This plant will be the largest steam plant in the southern states, having a capacity of 15,000 horsepower. It will be used to produce electricity to supplement the hydroelectric power of the company during the low-water periods in the Catawba and Congaree rivers and for emergencies. The plant cost $300,000 and will be pushed to completion so as to be ready for operation by the low water period next fall.

Underground Electric Railway Yard.

Blasted out of solid rock, two miles underground, in the heart of a mountain near Mullan, Idaho, is a fully equipped railroad yard with electrically propelled cars handling the rich lead-silver ore produced by the Morning mine, owned by the Federal Mining and Smelting Company. The work, which has just been completed under the direction of Charles K. Cartwright, required more than a year and involved the expenditure of several hundred thousand dollars and the labor of many men.

The yard, which is the only one of its kind in the Northwest, and is believed to be the largest underground mine yard in America, is 200 feet in length and 36 feet in width, the height ranging from 20 to 100 feet. The electrical apparatus and hoisting machinery are in a chamber, 50 by 78 feet and 20 feet high, while in the rear of the four-compartment shaft, now under construction, is an ore bin, 20 by 26 feet and 50 feet high, with a capacity of 1,500 tons. The shaft will be sunk to reach a depth of 2,600 feet.

Monterey Railway, Light and Power Company.

A group of Montreal and Toronto capitalists have purchased a large block of the preferred stock of the Monterey Railway, Light and Power Company from G. W. White & Company and N. W. Halsey, of New York, who originally secured it in payment for the lighting plant.

The company controls, in addition to the street railway and electric lighting, the entire water and sewage systems of the city of Monterey.

The capitalization of the company is $500,000 of five per cent first mortgage debenture stock, which is held almost entirely in England, $500,000 of cumulative preference stock, which is now held by this deal in Montreal and Toronto, and $4,100,000 of common stock.

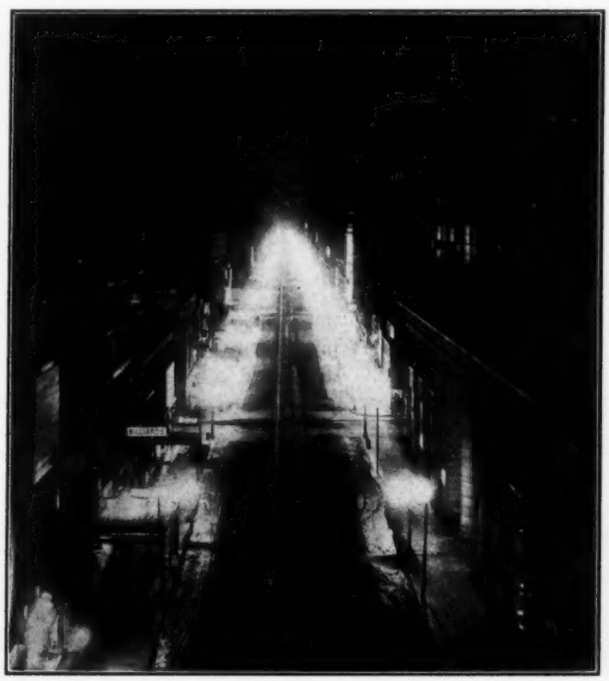
ELECTRIC LIGHTING and ILLUMINATING ENGINEERING

LIGHTING OF MARKET STREET, PHILADELPHIA.

A MODEL INSTALLATION.

When Mayor John E. Reyburn, of the City of Philadelphia, Pa., closed the switch on the stroke of twelve, Friday night, December 31, one of the most comprehensive systems of display street lighting in this country was inaugurated in the presence of many thousands of spectators attracted to the scene by the advance notices of the event, and Market street, from the Deleware River to the City Hall, at that moment sprang into prominence as a business street possessing a street-lighting system the equal, if not the superior, of any similar street on this side of the Atlantic.

Before New Installation.



After New Installation.

ILLUMINATION OF MARKET STREET, PHILADELPHIA, PA.

There has been a general awakening of the Philadelphia merchants to the realization of the fact that more light—electric light—of both a decorative and utilitarian character, is essential for the purpose of making the business districts sufficiently attractive and brilliant to draw the Philadelphia householders to the vicinity of the shops and business houses after dark. If any one person is responsible for this awakening of interest and for the fostering of the spirit of progressiveness which has resulted, in the case of Market Street, in the installation not only of an elaborate lighting system but also in the laying of a magnificent roadway, it is Mayor Reyburn, who both "in and out of season" has urged upon the city's lawmakers the necessity of these municipal improvements.

For two years the various business districts of Philadelphia have been agitating this question of brilliant street illumination. Many of the districts have held annual or bi-annual carnivals, at which times a large amount of decorative lighting has been temporarily installed, usually in the form of streamers of incandescent lamps, with spectacular sign installations, etc. These carnivals were so successful and aroused the interest of many of the merchants' associations to such an extent that in some cases these associations paid for a permanent lighting system from their own treasuries.

A natural result has been that the civic authorities have been urged to install supplemental lighting systems of this character. The first system of this kind to be installed, as stated above, was the Market Street illumination. The lighting of the Market Street shop windows, its sign display, supplemented by a number of brilliantly illuminated moving-picture-establishment exteriors, has, for some time, been quite the best and most elaborate of any business street in Philadelphia, and it was perhaps natural, therefore, that Market Street, because of its original enterprise, should

be the first to secure recognition from the civic authorities in the form of a permanent lighting system.

The Philadelphia Electric Company co-operated to the fullest extent with Chief McLaughlin of the Electrical Bureau in working out the preliminary details of pole design and construction, together with the accompanying underground wiring circuits. The installation of the poles, lamps and wiring cir-

VIEW OF ONE OF THE STANDARDS.

cuits was made with unusual speed. The design of the poles having been accepted by the city, the Philadelphia Electric Company assumed the expense of building and erecting the same.

All the poles are made of steel, with ornamental cast-iron base and trimmings, and weigh complete approximately 1,500 pounds each. The lamps are suspended from ornamental cross-arms made of cast iron. The two lamps on each pole are hung from the ends of these cross-arms, and the globes are on a plane eighteen feet from the roadway. The whole installation, lamps and poles, is of an ornamental character, and will be painted in imitation bronze. The speed with which this work was accomplished can best be appreciated when it is stated that all the poles were set and the necessary taps made in two weeks, and the difficulties of this work were greatly increased because of the fact that sixty of the special pole settings were in subway vaults, necessitating the cutting through of a great deal of the concrete and steel construction of the stations of the Rapid Transit Company.

The poles are set on both sides of the street—106 poles in all—approximately 100 feet apart. With this system, the street lighting of Market Street consists of sixteen arc lamps in approximately every 450 feet, an average of one arc clamp to less than every thirty feet of roadway. The lamps are 480-watt, direct-current series arc lamps, and each lamp is equipped with an absolute cut-out. The cable terminals were specially designed. Two special wiring circuits were installed, each circuit taking care of 106 of the arc lamps, and requiring an installation of fourteen miles of No. 6 rubber and lead-covered cable.

As regards the illuminating effect, this has been unqualifiedly successful, and it has received the most favorable criticism from all concerned. The city of Philadelphia has never been open to the criticism of having insufficiently lighted streets as compared with the lighting done in other cities of the first class, but this movement for even better lighting, persevered in, will enable Philadelphians to point with pride to the illumination of its business districts and to state confidently that no better lighting can be found anywhere.

New Filament Carriers for Metallic-Filament Lamps.

In a recent article B. Duschnitz describes the most recent forms of metal filament carriers produced by various manufacturers, among which that made

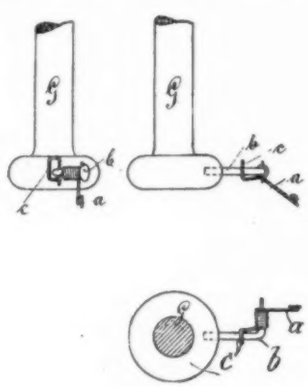


FIG. 1.

by the Allgemeine Elektriztaets Gesellschaft is of especial interest. The design is intended to permit the shortening of the filament which takes place during the initial burning period. The construction of this carrier is illustrated in Figs. 1 and 2. The movable parts *a* having the form of a spiral spring are carried by the hook-like fixed parts *b*, which are fused into the glass support. The movable parts *a* are provided with stops *c*, which lie against the radial parts fused in the glass rod G, when the movable parts turn. The latter have a very small cross-section in order to reduce the shocks to the filaments *f*, Fig. 2, during transport. But in spite of the small cross-section there must be sufficient heat radiation at the points where the

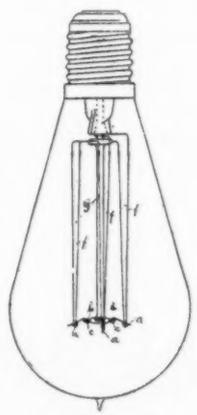


FIG. 2.

carrier and filament touch, as otherwise the wires might melt. The necessary radiation is provided by applying a paste of conducting metallic powder, as finely powdered tungsten, to the loop *a*, which holds the filament in place. The paste is burnt on by glowing in a reducing atmosphere. It is known that metallic filaments shorten considerably during the initial burning period, but all parts do not shorten uniformly, and in the carrier described allowance has been mad for the fact that some of the filaments *f* will contract more than others. The danger of their breaking is avoided by the spiral windings between projection *c* and the loop *a*, which serve as a spring and thus permit the filaments to contract.—*Translated and abstracted from Elektrotechnischer Anzeiger (Berlin), December 26, 1909.*

Approves Light Company Bonds.

Of the $5,000,000 of new bonds which the Kings County Electric Light and Power Company asked the Public Service Commission for authority to issue, the commission has authorized $2,500,000 and held the other $2,500,000 up pending further investigation. Engineers for the commission reported that the company needed $2,500,000 for extensions and betterments.

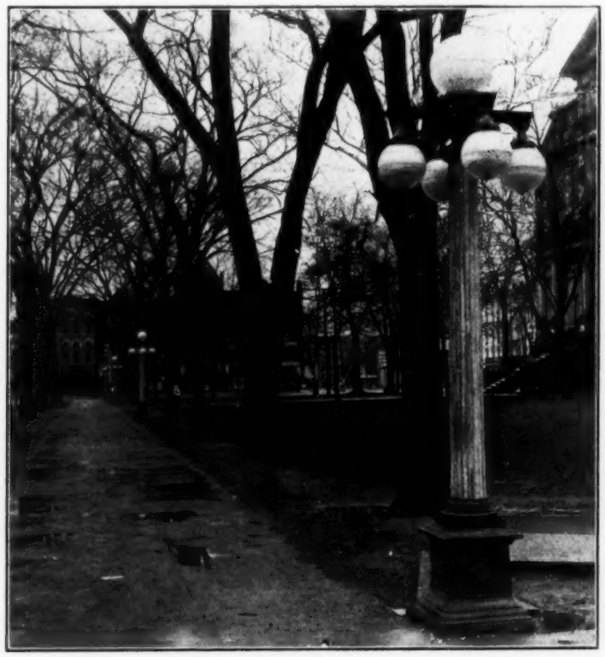
Tungsten Park Lighting in Newark, Ohio.

A tungsten street lighting system of considerable merit has just been installed around the Public Square in Newark, Ohio. Newark is a city of 28,000, the county seat of Licking County, and possesses one of those dignified "old time" court houses set in the center of a spacious square. The square is laid off with ample paths lined with an abundance of old trees, and along the four broad bounding streets is the business heart of the city.

Heretofore the illumination both of the Public Square and the adjoining streets has been very inadequate, consisting of pairs of sixteen-candlepower carbon lamps in opal globes on either side of the four entrances to the Court House, and eight arc lights over the streets equidistant around the Square. J. G. Barrett, general manager of the Licking Light and Power Company, recently appeared before the City Council, however, and made a strong plea for better illumination in the Public Square both as an incentive to the merchants to brighten their windows and to give Newark a striking example of how proper illumination may contribute toward the beautifying of a city. He suggested a series of decorative lamp-posts to be erected around the four sides of the Square just inside the sidewalks and offered to contribute the current for a stated term, if the city would make an appropriation for the equipment. The plan met with enthusiastic support from the city authorities.

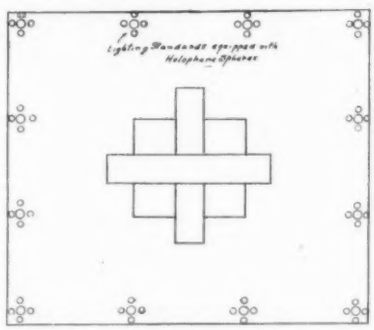
The dimensions of the Square are 374 by 324 feet at the sidewalk, and after a consideration of the many fixtures available it was decided to install twelve five-light Jandus "Luxolabra" standards just inside the sidewalks, placed one at each corner and two between. Each post is equipped with one 100-watt upright Mazda lamp and four sixty-watt Mazda lamps pendent from cross-arms, as shown in the illustrations. The lamps are inclosed in fourteen and twelve-inch Holophane spheres respectively, which gives the appearance of solid balls of light.

Night View.



Day View.

ILLUMINATION OF PUBLIC SQUARE, NEWARK, OHIO.

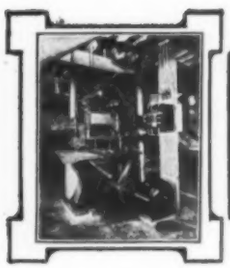


ARRANGEMENT OF LIGHT UNITS AROUND PUBLIC SQUARE, NEWARK, OHIO.

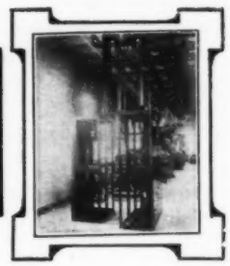
The installation has met with great popular favor and has greatly improved the appearance of the Public Square by day as well as by night. The old equipment at the entrance of the Court House is to be supplanted by similar lamps and glassware and there is talk among the merchants along the four surrounding streets of a further installation of these standards to complete the illumination of the business district. This is a logical step and to be expected, for the Newark business men have shown great interest in illumination during the last year. The greater portion of the stores and offices around the Public Square are lighted by tungsten lamps, which is particularly noteworthy in view of the fact that natural gas is sold in Newark at eighteen cents per 1,000 cubic feet.

Underground Conduit Construction to be Discussed in Chicago.

At the next joint meeting of the Electrical Section of the Western Society of Engineers and the Chicago Section of the American Institute of Electrical Engineers, which is to be held on the evening of February 23, Edward N. Lake, engineer of the division of electrical transmission and distribution, Board of Supervising Engineers, Chicago Traction, will read a paper on "Proposed Improvements in Underground Conduit Construction."



Industrial Power



ELECTRICALLY DRIVEN PUMPS.—VI.

THE HIGH-PRESSURE FIRE-SERVICE PUMPS OF MANHATTAN BOROUGH, CITY OF NEW YORK—PART I.

The following description of the pumping system of Manhattan borough, New York city, and of a series of tests recently made thereon, is abstracted from an article by R. C. Carpenter, Professor of Experimental Engineering in Cornell University, which was published in the Proceedings of the American Society of Mechanical Engineers:

The system protects the district extending north from City Hall to Twenty-fifth Street, and east, approximately, from the North River to Second Avenue. It comprises about fifty-five miles of extra heavy cast-iron main, from twelve inches to twenty-four inches in diameter, with eight-inch hydrant branches; and two pumping stations so located that they never can be in the center of a conflagration. At the present time the pumping stations have a combined capacity of over 30,000 gallons per minute delivered at a pressure exceeding 300 pounds per square inch.

The supply of water is ordinarily obtained from the water mains of the city, which deliver Croton water to the stations at a pressure of from fourteen pounds to forty pounds per square inch, depending on the demand for water in that district. Both of the pumping stations are located close to tidal water and connections are made so that sea water can be obtained in case of difficulty with the Croton supply.

The capacity of each of the pumping stations will be for the present 15,000 gallons per minute or 43,000,000 gallons per day for the two stations. By the installation of three additional units in each station, for which provision is made, this capacity can be increased in round numbers to 69,000,000 gallons per day.

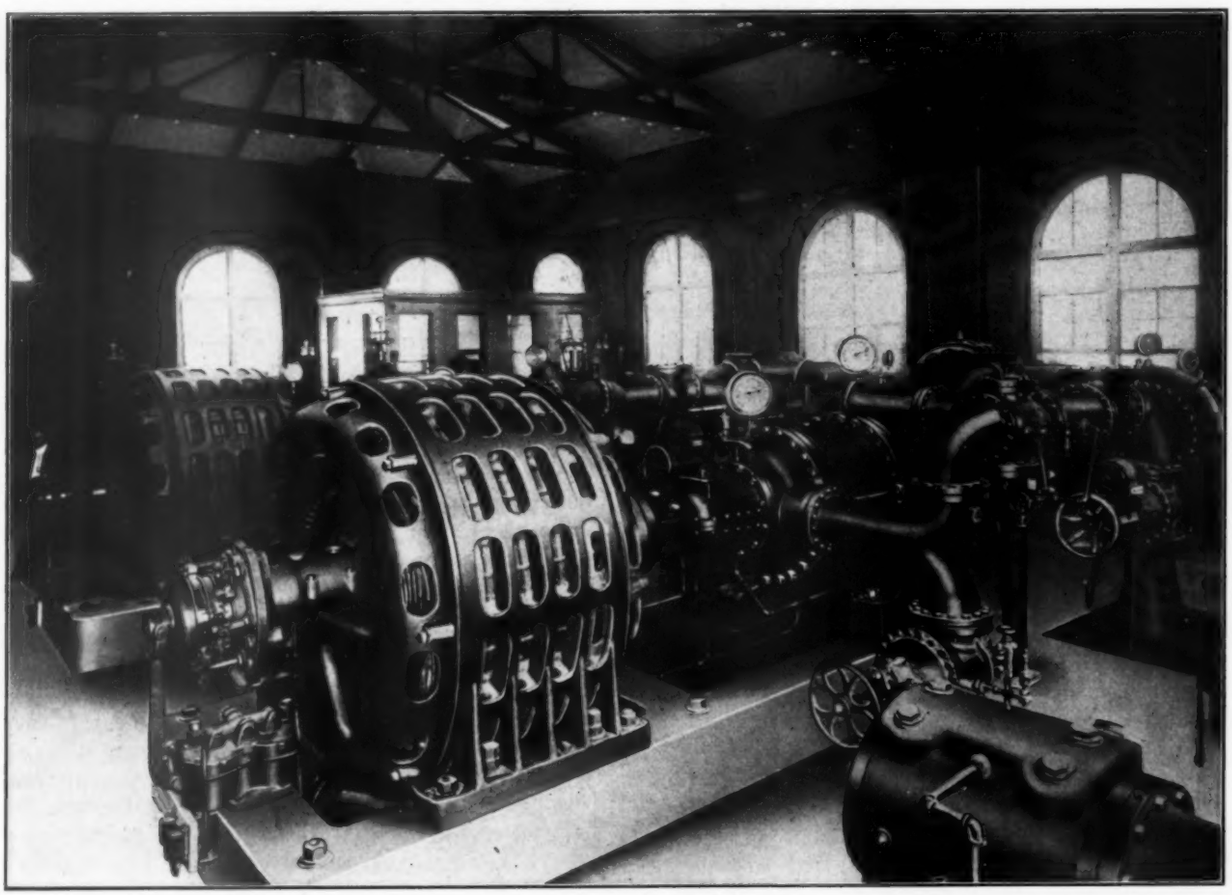


FIG. 1.—INTERIOR VIEW OF PUMPING STATION SHOWING MOTOR-DRIVEN CENTRIFUGAL PUMPS INSTALLED FOR THE MANHATTAN HIGH-PRESSURE FIRE SERVICE, NEW YORK CITY.

The two stations, with the motors and pumps as installed, have a total capacity in excess of that of all the fire engines in the Boroughs of Manhattan, the Bronx and Brooklyn working under normal conditions. This comparison assumes the engines to work on one line of two and one-half-inch hose, say 500 feet long, under a pressure of, say, 200 pounds, and with the capacities as printed in the official blank forms of the reports of the fire department. It should furthermore be remembered that provision is made for the installation of still another pumping station.

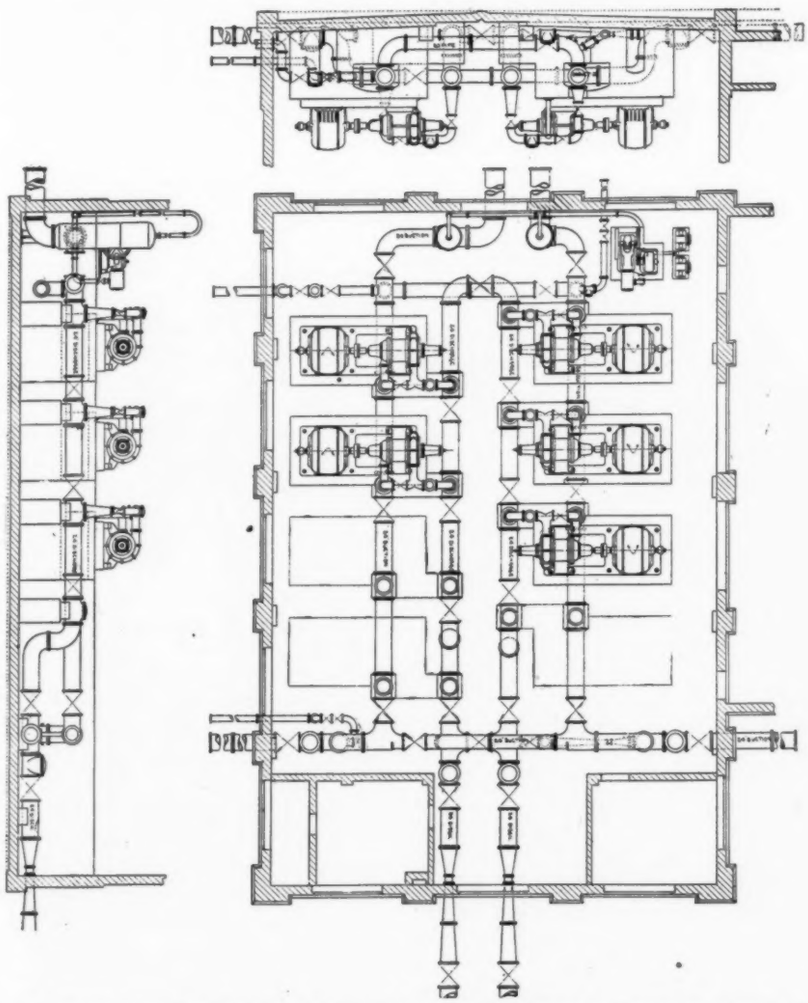


FIG. 2.—PLAN AND ELEVATIONS SHOWING ARRANGEMENT OF HYDRAULIC AND ELECTRICAL APPARATUS IN PUMPING STATION.

The power for driving the pumps is transmitted electrically from several of the electric power and lighting systems located on Manhattan Island. As the stations of systems are widely separated and any or all of them are available for motive power the system of electric transmission was considered more reliable in the case of a large and general conflagration than power plants maintained directly at the pumping stations. Each station is provided with two independent sets of transmission lines located as far as possible beyond danger of injury in case of a great conflagration.

The cost of erecting and maintaining an independent power plant would have entailed a greater annual charge than the cost of the electric current; consequently the present arrangement is advantageous from a financial standpoint.

In addition to the charge per kilowatt for the current delivered there is a charge aggregating $90,000 per year for reserving the first right of use for the necessary generating machinery for this purpose. The total cost maintenance of the system is estimated at $170,000 a year, which amount it is believed will be saved many times over by a reduction in insurance premiums now paid in the protected district.

The electric current is supplied at a pressure of 6,600 volts from the following stations of the New York Edison Company, having the capacity indicated: 53 Duane Street, 7,600 kilowatts: 115 East Twelfth Street, 1,700 kilowatts; 45 West Twenty-sixth Street, 400 kilowatts; Waterside Station No. 1 and No. 2, 196, 700 kilowatts. In addition there are feeders extending to the Brooklyn Edison Company stations which can be called on in case of an emergency demand.

The pumping stations are connected to eighteen substations, equipped with rotary converters and storage batteries, aggregating a capacity of 124,000 ampere-hours at 135 volts, an enormous reserve.

Each station is connected with the main stations of the Edison company by two 250,000 circular-mil three-phase cables laid in ducts, and two independent reserve feeders extend to the substation system of the Edison company. With all these precautions, interruption of the power supply would seem a physical impossibility.

The pipes, castings and hydrants were tested at a pressure of 450 pounds. The specified allowance for leakage in a ten-minute test was at the rate of four gallons in twenty-four hours for each lineal foot of pipe joint, equivalent to a leakage of 487,000 gallons for the whole system in twenty-four hours, which is somewhat over one per cent of the total specified pumping capacity now installed. The actual leakage on test was at the rate of 264,000 gallons per day or about six-tenths of one per cent of the pumping capacity. Considering the difficulties of construction and the high pressure, the results attained were remarkable and reflect great credit on the engineer in charge.

There are sufficient hydrants so that if a block were on fire sixty streams of 500 gallons per minute each, or the full capacity of both stations, could be concentrated on a block with a length of hose not exceeding 400 feet to 500 feet, assuming the use of three-inch hose and one and one-quarter-inch nozzles.

The layout of the mains at the stations both for suction and delivery is on the loop system; that is, the supply can be taken from either one of two mains, and the discharge is through either one or both of two mains. With this system even the breakdown of one

of the discharge mains at the station would only slightly reduce the pressure at the fire and would not affect the capacity of the station, as the pumps would be capable of forcing their full discharge through the short length of a single twenty-four-inch main made necessary by such an accident.

At the South Street Station the fresh water supply is derived from two thirty-inch lines, one connected at Chestnut Street to the thirty-six-inch line on Madison Street, and the other connected at Pike Street to the thirty-six-inch line on Division Street. These two main feeders, to which the two thirty-inch lines are connected, increase to forty-eight inches in diameter and extend independently and directly to the Central Park Reservoir and are also reinforced by connections with the main feeders in this section of the city.

An auxiliary salt-water supply, consisting of two thirty-six-inch pipes about 140 feet long, brings the salt water from the East River to a suction chamber located directly in front of the pumping station. This suction is so constructed that the pipes are always below mean low water, thus insuring a supply at all times and avoiding the possibility of a break in the suction caused by air getting into the suction lines. On the river end of this suction there are constructed heavy bulkhead screens which are readily accessible for cleaning. From the suction chamber there are taken two thirty-inch flanged mains to the duplicate set of mains in the pumping station proper. The vacuum in these thirty-inch pipes is maintained by automatic electric vacuum pumps located on the pump room floor of the station.

At the Gansevoort Street Station the fresh-water supply is derived from two thirty-inch mains, one connected at Twelfth Street to the forty-eight-inch line on Fifth Avenue, which runs direct to Central Park Reservoir, and the other connected to the thirty-six-inch line on Ninth Avenue at Little West Twelfth Street, which increases to a forty-eight-inch line and runs also direct to the Central Park Reservoir. These two main feeders, in addition to having their supplies direct from Central Park Reservoir, are also reinforced by connections with the main feeders in this section of the city.

The salt-water suction lines for this station are practically identical with those for the South Street Station except that the thirty-six-inch lines from the North River to the station are 650 feet long.

The two stations, known as the Gansevoort pumping station, located near Gansevoort Market on the North River, and the South Street station, located on the corner of Oliver and South streets near the East river, are identical in construction and equipment. The buildings are of simple design, of steel fireproof construction, with concrete foundations. The Gansevoort Street building, which is typical of both, is one story high with basement, sixty-three feet, eight inches by ninety-seven feet, four inches. Each station is large enough for eight pumping units.

There are now five units in each station consisting of Allis-Chalmers five-stage centrifugal pumps driven by Allis-Chalmers induction motors and the necessary auxiliary machinery. The motors and pumps are alike and their parts are interchangeable.

The pumps each have a specified capacity of 3,000 gallons per minute of sea water, working with a suction lift of twenty feet, and a delivery pressure of 300 pounds per square inch. The actual capacity as indicated by a twenty-four-hour test was about thirty per cent in excess of that specified. The original specifications contemplated the use of six-stage pumps, with the expectation that sea water would be used at each fire. Because of the facts already referred to that the relative amount of water required for fire purposes is insignificant and that salt water may do considerably more damage to goods than fresh water, a change in the specifications was agreed to whereby the pumps should work at best efficiency when receiving water from the Croton mains at a pressure on the intake side varying from fifteen pounds to forty pounds per square inch.

To meet this new condition the pumps were all built with five stages. All the sea connections and priming machinery as originally contemplated were installed, so that sea water can be pumped into the mains wherever desired. The effect of the change is merely to reduce the pressure head slightly in case sea water is used.

The floor plan of the buildings and general layout of machinery, piping, switchboards, etc., are shown in Fig. 1. As will be seen space is provided for three additional units. Working detail plans of the machinery were furnished by the contractor. The arrangement shown in Fig. 2 is the same for both stations, the only difference being that the switchboard and office in the South Street station are on different sides of the building as compared with the Gansevoort station.

(To be continued.)

A Large Electric Crane.

Vice-Consul Carleton Miller, of Nagasaki, submits the following report on the installation at Akunoura, Nagasaki, for the Mitsu Bishi Dockyard and Engine Works, of a 150-ton giant hammer-head crane from Great Britain:

This crane is 177 feet high, is the largest in the Orient, and one of the largest in the world. Nearly one and one-half miles of electric cable are used in distributing the current. The crane is operated by five separate motors, each of fifty horsepower, at 400 revolutions per minute, taking 200 volts each. These motors are adapted for light and heavy lifting, racking, and slewing. One man can work the crane from a cabin underneath the main girders. From this position, 100 feet in the air, he has a clear view of all the operations.

The crane has a jib or arm 156 feet six inches long, revolving on a number of cast-steel rollers (ninety in all and fifteen inches in diameter) at the top of the tower. Power is transmitted from the motors by spur and bevel gearing. The tower supporting this jib has four columns at forty feet centers, braced in all directions. The entire weight is transmitted down these to the massive concrete foundation—a solid block of concrete forty-six by forty-six by thirty feet, resting on a rock bed. The sixteen holding-down bolts, three and one-half inches in diameter and twenty-five feet long, are anchored by channels. At no period is there any pull on the foundation, as the center of gravity is always inside the columns, whether running light or heavy. Two sixty-five ton tanks back of the girder preserve equilibrium. All hoisting and cross-traverse gear is in a large house at the extreme end of the crane, this machinery also serving as ballast. Ladders and platforms are provided up the tower and jib, giving easy access to all parts.

The main work intended for this crane is placing boilers, engines, and other heavy machinery in position.

THE PECULIAR NATURE AND DRAWBACKS OF THE ELECTRIC MOTOR BUSINESS.

S. H. SHARPSTEEN.

A person with a philosophical turn of mind who has worked at, or has had occasion to study, the electrical industries during the last twenty years cannot help asking himself: "Why does not the power part of the business improve more rapidly."

Money is not tight. At all points opportunities present themselves for the electric motor to come in and do the work that is now being done by a more expensive and cumbersome method. Transmitting and generating apparatus have reached a scientific basis with all fundamental patents expired. There is an abundance of cheap power at hand to drive the generators, and still the healthy growth that characterizes many other lines seems to be lacking in the motor industry.

When the motor business improves, the generator and lighting industries will advance accordingly, but it is nevertheless true that at the present time the manufacturers of heavy electrical apparatus are paying the best salaries to people selling generating apparatus that is furnished according to well drawn specifications, and are willing to make almost any change that a consulting engineer may suggest in order to get the business; while the motor business that is the real life of the generator line and wants flexibility to make it succeed, is in most cases rigidly confined to standard apparatus and is left to the poorest engineering and selling part of the organization.

The good salesman that has been in close touch with the motor business during the past ten or fifteen years realizes how the motor business would advance if the engineers could be brought into close touch with the demands of the trade and be allowed to build the proper apparatus, but the pressure at the factories to keep down the first cost compels the engineers to hold closely to standard patterns and practice.

Ten years ago the manufacturers were more flexible in this respect and would make changes to get motor business started rightly. Under this ruling motors were applied to many kinds of machinery. The result was what might be considered as a very important industry, every motor manufacturer having more business than he could handle. This demand for motors decreased the attention to developing motor applications, the sale of only standard apparatus was advocated, and all time and expense were devoted to securing orders for standard goods. A low class of selling talent was used to help buyers in lines that had been established. Consequently, the pendulum has swung to the other extreme and the whole attention is devoted to cheapening the product and cutting prices until there is practically no money in the business, and hence but little incentive to push it.

Undoubtedly there are men that are now holding influential positions with electric-motor manufacturers that were not interested in this line when the foundation was being put down for the motor business which flourished a few years ago, and these men would like to know more of how it was done.

The following example will serve to illustrate: When the printer commenced to use electric drive for printing presses he demanded a motor that could be placed directly on the driven shaft of the press, thus dispensing entirely with belts. This was a start in the wrong direction, as the motor was very large and of too slow a speed for the work; installation and maintenance costs were also excessive, as all parts were special or away from standard practice and required much time and trouble to obtain. The frame of the press, to which the large special motor was bolted, was not heavy enough to hold the motor frame and armature properly, hence when the motor field was excited the whole combination would move about in many cases, in such a way as to produce undue friction and thus overheat the bearings.

The controlling devices that were used in conjunction with the motors were cheap and were constantly breaking down and putting the presses out of commission. About this time the firm of Harper and Brothers, of Franklin Square, New York city, employed R. A. Freeman as superintendent to change its plant over to electric drive. Mr. Freeman, together with a salesman of one of the large electrical manufacturing companies, looked over various printing plants that were using motors to drive flat-bed cylinder presses, and spent much time in considering drive and control of this nature. It was finally decided, after talking with people who had motor installations in their print shops, that unless a different and more economically, practical, and substantial line of apparatus was installed, the use of this new drive for printing presses would not become popular.

After some months of deliberation, it was decided that a standard motor coupled to the press with a short belt, and using a substantial foolproof controller, was the only practical arrangement to operate a cylinder press.

With the short belt came the trouble of slipping when the motor started the heavy press parts. Mr. Freeman finally demanded an idler pulley, made as a part of the motor, so that it would be self-contained and stay in proper alinement, the idler to be furnished with a pulley that would be held against the non-pulling side of the belt by a spring to allow the pulley to adjust itself to the conditions that might exist at any time. This almost staggered the salesman, but Mr. Freeman insisted and finally the proposition was put up to the head of the department and the usual objections of the engineers came back. After some consideration the matter of getting electric drive in so prominent a printing plant as that of Harper and Brothers was held of sufficient importance to overcome these obstacles, and finally belt-connected motors, with practically standard parts and speeds, were installed to drive the cylinder presses, only the motor head with the idler being special.

Soon it was found that the automatic belt-tightening motor was a very good seller, and today all motor companies of any importance are making motors with idler pulleys.

Mr. Freeman concluded to pay for a drum-type controller, built scientifically and with heavy parts, very similar to the trolley-car type. To make a controller of this nature for printing presses required a lot of special engineering and tools, and it was claimed at the factory that the printer would never pay $125.00 for what he could get for $25.00. At any rate orders were taken for foolproof, printing-press, drum controllers at good prices, and finally this type of controller became a standard article, and, with the belted motor, has been largely adopted.

Every large industrial center throughout the United States can now take up the important question of pushing ahead this industry in accordance with any peculiar requirements.

ELECTRICAL Advertising *and* Selling

A FEW THOUGHTS ON "POWER ADVERTISING."

BY CHARLES A. PARKER.

All advertising should be planned and prepared with its purpose constantly in mind. Its immediate aim should be remembered and the most minute attention paid to its appropriateness to this end for if advertising is not suited to its purpose it cannot possibly fulfil its one and only mission.

Unfortunately for the man who pays the bills, all advertising matter is not planned and prepared in this way. Indeed it is scarcely putting it too strongly to say that most of it is not. Altogether too much money has been thrown away on advertising that happened to please the advertiser's fancy, represented some flight of imagination, or was inspired by some style of advertising in an altogether different line of business. In fact, a large part of the advertising sent out seems to originate in almost every conceivable way other than from a careful study of the work to be done, and, as a result, it is not adapted to bringing in results. Advertising should not be regarded as an outlet for cuteness, cleverness or wit. There are plenty of smart magazines existing for the latter purpose. However, cleverness and brightness are good in advertising provided they serve to catch and hold attention while the pointed truths and arguments that the advertiser has to present are driven home with unerring logic. Otherwise, they are out of place.

All this has suggested itself to the writer by a quiet little meditation on the very pertinent question—"Why is it that many central stations have found advertising to increase their power load less productive of results than some of their other branches of publicity?" And the root of the whole difficulty seems to be in just the point we have been discussing—the adapting of advertising to the purpose.

In the history of power advertising there seems to have first been a tendency to "shoot" over the head of the prospect. Then, following the example of the pendulum which swings from one extremity of its arc to the other, there seems to have been a period when central station power advertising took on a slangy, superficial character that fell far short of the mark. That is to say early central station power advertising was apt to be technical, that was beyond the comprehension to the ordinary manufacturer and had nothing about it to induce him to study the matter out for himself.

Then—as if to make up for past failings there seems to have been a stage when noise, "clever" slang, and freak stunts supplanted good sense and logic.

Power advertising should be planned and prepared with its purpose constantly in mind because only by so doing can every "blow" be delivered right where it will do the most good. Only in this way can the number of "misses" and "glancing blows" be reduced to the very minimum.

Before we lose ourselves in other phases of our discussion it may be well to clear up one point now. While it is true that a writer who is dealing with the question in a general way can expound a few general principles of successful power advertising, he cannot expect to offer a complete solution of the concrete problems of individual central stations. Neither can he tell in a cut and dried fashion exactly how to strike the happy medium between making advertising matter dull and technical and having it too noisy and superficial to call for serious consideration.

There is only one thing that will find the solution, and that is advertising ability spurred on by enthusiasm, inspired by the honesty of the proposition, and backed up by a comprehensive mental grasp of the situation.

STUDY THE MAN YOU ARE AFTER.

The best way to settle on the best style of advertising that will be most effective is to study the man to whom it goes.

The people who concern us just at present are manufacturers,—men who spend a good share of their days looking for new places in which to dispose of their wares and thinking of ways in which to make them more "disposable;" and men who are lying awake nights thinking of ways and means to keep "cost" from assailing and utterly annihilating that little difference between itself and selling price known as profit.

All of the manufacturers do not interest us in the same way and they should therefore be classified as follows: Class I for manufacturers who are just starting in business or who are seriously considering changing their form of power. Class II—For manufacturers who are dissatisfied with their private plant, be it steam or electric. Class III—For those who do not care to listen to the alluring story of "Individual Motor Equipment and Central Station Power."

Manufacturers in Class I and Class II offer the most fertile field for increasing the power load. Before any man adopts central-station electric power, his mind must, consciously or unconsciously, go through two distinct stages. First he must be converted to the idea that there is no energy possible that can surpass electricity for potential productivity, minimum cost per unit of goods made, and general convenience.

With this notion firmly lodged he must then be made to see that there is no way of securing electric energy that can compare for ease and economy with central-station service. This done, the rapidity with which you get action depends largely upon the force of innate inertia in the individual case.

A FEW FUNDAMENTALS.

This, then, is the work that power advertising must do. To lay down hard and fast rules for producing such advertising is quite impossible because such rules do not exist. Or, to put it more exactly, the minute a certain method of advertising becomes so well established as to justify a "rule" that minute that particular method will become obsolete. A new and radically different style will prove to be more effective.

1 The fourth of the present series of articles on "Central Station Advertising" appearing in the second issue of each month.

The whole situation harks back to the fickleness of human nature and its love for novelty and change.

Rules, however, are one thing, principles are another. There are eternal and fundamental principles underlying all effective advertising that are quite independent of the vagaries of human nature. For instance, the statement just made—"the minute a certain method advertising becomes so well established as to justify a rule, that minute that particular method will become obsolete. A new and radically different style will prove to be more effective." This is a statement of a principle of advertising. Just so are there principles of power advertising that may be pronounced with some degree of certainty.

The first and possibly the greatest of these is that you cannot expect your power advertising to bring results unless it breathes forth—in every word and sentence—the fact that you know what you are talking about. It must show knowledge and by knowledge the writer means a real comprehension of the power problem. If the prospect does not get this notion at once, you lose out at the very start.

This does not mean that you can be technical, verbose, or dull; it means that every word you say must count for something and have some significance. This fact, however, need cause no alarm for there is no dearth of arguments. There is plenty that can be said against private power plants of whatever nature they are and plenty to be said in favor of central station service.

Here, for instance, is one fundamental notion but if you can drive it "home" effectively it will prove to be a winner.

Power is in a sense an evil, a necessary evil. A man has it not because he wants it but because he has to have it to produce his chairs, bookcases or what nots—which, presumably, he knows how to make and make profitably. Every cent of capital and every ounce of energy he is called upon to give to his power plant would bring him greater returns if it were devoted directly to making chairs, bookcases, etc. Central-station service makes it possible to do this very thing, therefore he ought to use central-station service.

For every day consumption, it is necessary to resort to less abstract ideas. Here we find the first point open to our attack to be those drawbacks of the private plant which the mere possession of central-station service overcomes, that is to say those troubles which are natural accompaniments of the engine and boiler. Whether it is a remote possibility such as a fire or explosion or one of those ever present, constantly recurring, and expensive annoyances such as a small breakdown that ties up the plant or the complication of keeping costs accounts due to a large variety of widely varying items, whatever, we say, the point you are arguing is that overdoing the matter does not pay.

If the manufacturing industries of your communities are carried on under unusual circumstances, that will naturally call for special treatment. This, however, is not generally the case, and it is quite possible for one central station to profit by the experience of other central stations. In addition to this, syndicate advertising can be successfully employed thereby enabling the wise advertiser to kill two birds with one stone. He gets the highest class of advertising for a price that would bring him something very cheap indeed if he produced it himself.

It pays to use figures, real if possible—hypothetical if necessary.

As a recent writer pointed out in these columns, the financial value of central-station electric service is not, in essence, that it cuts down the aggregate power cost, although it often does that very thing. The point to be made is that central-station service, as a general rule, cuts down the cost of each unit of manufactured goods whatever that unit may be. It enables the manufacturer for the same power cost or for a slightly increased power cost to increase his production at a higher rate. This does not imply, however, that central-station service never cuts the actual power cost.

The other points that should be emphasized have been so well threshed out as to scarcely deserve giving much space here. There is, however, this to be remembered and played upon that they are all in line with modern ideas and ideals, cleanliness, light, flexibility, independence of each individual machine, the physical and psychological effect on the workers are all phases of central-station service upon which the spot light of public attention can be turned to good advantage.

HOW TO SAY YOUR "SAY."

Second in importance only to the arguments themselves is the manner in which they are presented. It does not do very much good to have good talking points if your hammering away at them does not do anything more than stir up a ripple on the surface.

Boiled down to its very essence, there is one way to avoid throwing advertising money away. And that is to take a few fundamental facts into consideration and write your power advertising with them in mind. First, the number of power users is limited. This enables a concentration of effort that should be of great assistance toward doing effective work. Second, business men are, after all, human beings. They demand, it is true, knowledge and good sense on your part but, that existing, they are subject to every other impulse which sways mankind. And the successful power advertiser is the man who can play most skillfully upon this human instrument.

YOU ARE ADVERTISING TO ADVERTISERS.

Here is another important item that must under no circumstances be neglected. Business men are perhaps more critical of advertising matter than any other class of people outside of those actually making a business of producing it. It is only natural that they should be as most of them are constantly getting out such matters on their own behalf and their incoming mail is full of it. A good part of the matter received is good. Now your advertising must compete with other advertising for attention. If it does not compare well, it loses out. For this reason, it were better to cut out the advertising appropriation entirely rather than make it so small that only cheap matter could be mailed out. To compare favorably, your advertising must be clever both in conception and execution. It must be well written, well illustrated, and well printed.

It must be kept in mind that power advertising by no means contemplates doing away with the solicitor. The solicitor is quite as important as ever, and he ought also be busier than ever. The minute your advertising stirs a prospect up so that he shows signs of life—the solicitor should be after him to settle the deal.

Here is something else that must not be overlooked. It is no small proposition to ask a man to switch from one method of securing power to another. So you can not expect your power ad-

vertising to produce quick results. You must think in terms of campaigns rather than individual advertisements. The folder you sent out three months ago may have created the interest which brings you a new contract today. So here, more than in any other phase of central-station work—are patience and persistence cardinal virtues.

In closing, let us suggest an idea that, although it may strike you as rather peculiar and somewhat idealistic, is well worth thinking about. The writer conscientiously believes that it is the humanitarian duty of every central station to advertise constantly and vigorously for new power business. No one will deny that electricity in all its practical forms is a boon to mankind in health and sickness. The more factories that are run by electricic power, the more happier, contented and healthy workmen there are. Electric power is good for employer and employee. By increasing your day load and bringing it more nearly on a level with the peak, you are preparing for the day when matters will adjust themselves in such a manner that, with increased profit to yourself, you can make electricity for the homes so cheap that all who will can have it.

Boosting Current Sales.

An effective manner of boosting current sales has been adopted by the Railway and Light Company, Rochester, N. Y., by renting electrical hoists to building contractors. Many such contractors cannot afford to own a hoist, and the renting plan appeals to them.

The hoist offered has a fifteen horsepower motor and a hoisting capacity of 2,200 pounds at 175 feet a minute or 4,400 pounds at 88 feet per minute. The company rents the hoist for $2 per day with a minimum charge of $10, and delivers the outfit on the site of the operations ready for work.

The company also holds in stock an alternating-current motor with which to replace a direct-current motor when the apparatus is used in outlying districts. The substitution is made without charge to the contractor and the rates for energy are those approved by the Public Service Commission and published by the company.

Based on the daily use of the connected load, the rate varies from eight cents to two and one-half cents per kilowatt-hour, subject to various discounts.

GETTING POWER BUSINESS.[1]

BY F. H. GOLDING.

In planning a systematic campaign it is well to obtain complete and accurate data on each plant which may be considered a prospect. These data should embrace operating costs in detail, size, make, age and condition of the various classes of equipment, original cost of equipment, general condition of power plant and any other unusual facts which migh have a bearing on the subject.

If possible the engine or engines should be indicated and a record of the average and maximum loads thus obtained. It is seldom wise to accept the prospective customer's estimate of his requirements in lieu of the engine indication, as the average manufacturer will invariably overestimate the horsepower used in his plant.

Information of this character is not usually difficult to obtain, because, as a general rule a factory manager either has so little knowledge of his costs that he is glad to have an expert work them out for him, or else he thinks that he is making power cheaper than the central station can sell it and will give the desired data for the purpose of demonstrating to the power man that he knows the business better than the central station does.

With an accurate report of this nature before him it is comparatively easy for the central-station man, before opening negotiations with the prospect, to determine whether a proposition can be made which will interest him and can also avoid the humiliation of submitting a power proposal to a manufacturer only to be shown that he is already making his own power cheaper.

Soliciting power does not bring as quick returns as the same effort on light solicitation, because, as a rule, a considerable investment on the part of the prospective consumer is involved and the average manufacturer must be convinced that the expenditure of a larger amount of money is justified. Our company, which kept a man on power exclusively for two years, is now trying the experiment of training lighting solicitors in power work and eliminating the special power man, with excellent results thus far, the theory being that whereas the power man's frequent rebuffs tend to cause him to lose heart, the mixing up of light solicitation with power enables the representative to secure some business and so keeps him from becoming discouraged.

In the effort to secure the larger plants, it should not be lost sight of that it takes only a few little fellows to equal a big one and the former are much more profitable than a single consumer.

1. Abstract of paper read before the Illinois State Electric Association, October 28, 1909.

Publicity that Counts.

The Scranton Electric Company, Scranton, Pa., has recently completed a mammoth electrical fountain sign, its gift to the city, in which the words "Watch Scranton Grow" appear. This gift has cost the central station something over $3,000 but that it is money well spent may best be shown by quoting from a Scranton daily:

"Everybody that walked in the central city for the last ten days witnessed workmen high in the air putting up the fountain, but when a great flash of light burst suddenly forth on top of the building with the darkness of early night, Christmas shoppers were startled for a moment. People stopped in their hurry to take a look at the scene. Twenty feet in the air above the roof rose the electric spray of the fountain, falling gracefully down toward the roof. Across the thousands of small lights, of which it is made, was spread in glowing letters 'Watch Scranton Grow.'

"The completion of the fountain not only gave to the city a Christmas gift that will be a lasting advertisement for the city, but marked the fruition of the plans of Duncan T. Campbell, superintendent of new business for the American Gas and Electric Company, which controls the Scranton Electric company, to give the city something worth while."

Solicits Complaints.

A central station in Kansas is publishing a series of advertisements asking the people of the city to notify the company if any of the city or private lamps fail to operate.

This company has a man on duty all night who answers the complaints and looks after the trouble.

This is just another way of creating that feeling of friendship between a central station and a community which always results in greater revenues and the satisfaction of all concerned.

FINANCIAL REPORTS OF ELECTRICAL COMPANIES.

DETROIT UNITED RAILWAY.

The summary of the business of the Detroit United Railway; Rapid Railway; Sandwich; Windsor & Amherstburg; Detroit, Monroe & Toledo Short Line and the Detroit, Jackson & Chicago Railway for the year ended December 31, 1909, compares as follows:

	1909	1908
Gross earnings	$8,047,555	$7,114,760
Operating expenses	5,042,724	*4,559,123
Net earnings	$3,004,831	$2,555,637
Other income	144,833	64,957
Total income	$3,149,664	$2,620,594
Deductions—Interest on funded debt and taxes:		
Detroit United	$1,325,568	$1,138,799
Rapid Railway	159,578	135,050
Sandwich, Windsor & Amherstburg	26,804	23,785
Detroit, Monroe & Toledo	147,166	122,131
Detroit, Jackson & Chicago	221,013	198,900
Dividends	.....	.....
Depreciation reserve	400,000	300,000
Contingent liability reserve	100,000	50,000
Total deductions	$2,380,129	$1,968,665
Surplus for year	†769,535	651,928

*Includes taxes.
†Equal to 6.15 per cent earned on $12,500,000 capital stock as compared with 5.21 per cent earned on same stock last year.

BROOKLYN HEIGHTS RAILROAD.

The New York Public Service Commission has issued a report covering operations of the Brooklyn Heights Railroad Company, including the Brooklyn City Railroad Company for the year ended June 30, 1909:

Operating revenue	$6,889,962
Operating expenses and taxes	4,940,875
Net operating revenue	$1,949,087
Other income	50,232
Total income	$1,999,319
Interest and rentals	2,121,549
Net corporate loss	$ 122,230
Net profit and loss debit	8,653
Net corporate deficit	$ 130,883

CUMBERLAND TELEPHONE AND TELEGRAPH.

The Cumberland Telephone and Telegraph Company has issued a statement of income for the year ended Decemeber 31, 1909, compared as follows:

	1909	1908
Gross earnings	$6,615,368	$6,141,818
Expenses	3,879,440	3,662,972
Net earnings	$2,735,928	$2,478,845
Charges and taxes	579,081	485,415
Surplus	$2,156,847	$1.993,430

LAKE SHORE ELECTRIC.

The report of the Lake Shore Electric Railway Company for the month of December and twelve months ended December 31 compares as follows:

	1909	1908
December gross	$ 89,062	$ 80,286
Expenses and taxes	47,754	47,193
December net	$ 41,307	$ 33,093
Charges	35,011	34,480
December surplus	$ 6,296	$ *1,387
Twelve months gross	1,109,082	1,035,650
Expenses and taxes	586,184	581,548
Twelve months net	$ 522,899	$ 454,101
Charges	414,950	390,732
Twelve months surplus	$ 107,949	$ 63,369

MASSACHUSETTS ELECTRIC COMPANIES.

The Massachusetts Electric Companies reports earnings for the quarter ending December 31, 1909, compared as follows:

	1909	1908
Gross	$1,921,073	$1,672,655
Expenses	1,328,901	297,328
Net	$ 592,172	$ 475,327
Charges and taxes	444,654	432,827
Surplus	$ 147,518	$ 42,500

TRI-CITY RAILWAY AND LIGHT.

The report of the Tri-City Railway and Light Company for the month of December and twelve months ended December 31 compares as follows:

	1909	1908
December gross	$ 204,859	$ 178,259
Expenses	$ 110,659	96,652
December net	$ 94,200	$ 81,606
Twelve months gross	2,038,728	1,819,077
Expenses	1,148,141	1,069,317
Twelve months net	$ 890,587	$ 749,760

PHILADELPHIA COMPANY.

The Philadelphia Company has issued a statement of earnings to the New York Stock Exchange for the eight months ended November 30, 1909, as follows:

Gross earnings from sales of gas		$3,178,512
Gross earnings from sales of oil		357,035
Total gross earnings		$3,535,547
Total operating expenses and taxes		1,683,326
Net earnings		$1,852,221
Other income		1,398,670
Total income		$3,250,892
Fixed charges		867,612
Balance		$2,383,279
Improvements, betterments, extensions, etc.		584,728
Surplus		$1,798,551
Surplus April 1, 1909		3,336,696
Total surplus		$5,135,247
Deductions from surplus:		
Appropriations for divs. on preferred stock	$200,000	
Appropriations for Con. Gas Co. guar.	53,333	
Dividends on common stock	997,197	
Discount on securities sold	250,000	
Bonus paid on authorized increase of common capital stock	8,333	
		1,508,863
Surplus Nov. 30, 1909, per bal. sheet		$3,626,384

AMERICAN LIGHT AND TRACTION.

The report of the American Light and Traction Company for the month of December and twelve months ended December 31, compares as follows:

	1909	1908
December gross	$ 391,822	$ 310,342
Expenses	9,562	3,000
December net	$ 382,259	$ 307,342
Twelve months gross	3,345,440	2,723,063
Expenses	106,261	45,000
Twelve months net	$3,239,179	$2,678,063

Annual Report of Western Electric Company.

At the annual meeting of the Western Electric Company, which was recently held in Chicago, a report given by President H. B. Thayer showed the excellent financial condition of the company. The following is taken from the report:

"The company's sales for the fiscal year ending on November 30, 1909, were $45,575,000, as compared with $32,314,000 for the previous year, an increase of forty-one per cent. This increase in the volume of sales compares favorably with the increase for the same period of large enterprises in this country. For 1909 the number of orders received in America was 695,000, as compared with 572,000 for 1908, and the value of an order for 1909 was $62.00, as compared with about $47.00 for 1908.

"The net earnings for the year, after deductions for depreciation on plant and merchandise and interest paid, were $2,089,000, which is 13.9 per cent on the capital stock. Dividends to the amount of $1,200,000 were paid from these earnings and the balance was added to the surplus, making the book value of the capital stock $216.24 per share."

EARNINGS AND EXPENSES FOR 1909.

Gross sales	$45,575,000
Cost	43,206,000
Net profits on sales	$ 2,369,000
Interest paid	280,000
Net earnings on investment	$ 2,089,000
Dividends paid	1,200,000
Added to surplus	$ 889,000

"The total current assets, including sundry investments, at December 1, 1909, were $30,781,000, which is more than three and one-half times the total current liabilities.

"The company has turned over its patents, tools and patterns used in the manufacture of machinery for power and lighting to the General Electric Company, with whom an arrangement has been made to manufacture a line of this apparatus which will be sold by the Western Electric Company.

"It has seemed best to make such an arrangement, both because of the growing demand for capital to keep up with the growth of the power apparatus business, and because the increased demand for telephonic apparatus points to a greater demand for capital.

"On December 1, 1909, the number of employes was 17,848 as compared with 14,449 on December 1, 1908."

At a meeting of the board of directors following the stockholders' meeting the officers of the past year were re-elected. These are as follows: H. B. Thayer, president; H. A. Halligan, F. R. Welles and W. P. Sidley, vice-presidents; G. C. Pratt, secretary; R. E. McEwen, assistant secretary; J. W. Johnston, treasurer; John Bray and E. R. Gilmore, assistant treasurers.

INDUSTRIAL SECTION

ILLUSTRATED DESCRIPTIONS OF NEW AND STANDARD ELECTRICAL AND MECHANICAL APPARATUS

A New Type of Controller for Motor-Driven Valves.

Many large hydraulic power houses are springing into existence beside our great waterfalls and the water motor, coupled to the electric generator, is transforming the potential energy of

FIG. 1.—STARTING PANEL OF VALVE CONTROLLER.

these great masses of water into electric power for transmission to distant points and distribution to the general public.

The certain and quick control of the amount of water to be admitted to the water motor, under all conditions of operation, presents a problem which is best solved by the use of motor-driven valves provided with remote control. Such apparatus must be of rugged and substantial construction, as it is subjected to very severe service. The motor is required to start quickly under full load, and thus must take a large starting current. It must stop instantly.

FIG. 3.—LIMIT SWITCH.

The General Electric CR-130 controllers have been designed for this service, and consist of three separate parts, starting panel, control panel, and limit switch. The control panel only is placed at the point from which the valve is to be controlled. The starting panel can be placed anywhere, while the limit switch is connected directly to the valve stem.

The general appearance of the starting panel is shown in Fig. 1. The circuit is made and broken by contactors, the magnetic blowout feature of which enables them to open the circuit without appreciable arcing. Two of the contactors close the motor circuit for one direction of rotation and the other two for the reverse direction.

As the majority of the motors operating valves are series or compound wound direct current, those up to and including five horsepower may be thrown directly on the line without the interposition of a starting resistance. The panel illustrated in Figs. 1, 2 and 3 is for this service.

FIG. 2.—CONTROLLING PANEL.

The controllers designed for medium sized motors, have additional contactors which cut resistance into or out of the armature circuit. For large motors requiring at least seven steps of starting resistance, the panel is mounted upon pipe supports and the extra contactors are replaced by a solenoid operated switch. The controllers are equipped with the new CR 187 units which are claimed to be non-fragile, fire and moisture proof, and thoroughly ventilated.

The control panel shown in Fig. 2 contains two pilot lamps for indicating the position of the valve gates, and two relays for closing the circuit of the coils which close the contactors. The relays are so interconnected that should one be closed and an attempt made to close the other, the one previously closed would open, preventing any possibility of a short circuit resulting from this action and making the device "fool proof."

The switch arm of the limit switch is moved over the contacts by a rod attached to the valve stem. The length of the rod is so adjusted that when the valve is completely opened or closed the limit switch is either at the upper or lower end of its travel, where it short circuits the coils which close the contactors, allowing the latter to open, disconnecting the motor from the line.

The valve is opened by pushing up the core of the relay marked "to open" on the control panel, closing the circuit through two of the contactors on the starting panel and applying half voltage to the pilot lamp causing it to burn dimly, indicating to the operator that the valve is being opened. When the limit switch opens the line contactors it also applies full voltage to the pilot lamp which then continues to burn at full brillancy as long as the valve remains open. The pilot lamps indicate the position of the valves at all times.

Lehigh Valley Adopts Telephone for Train Dispatching.

The Lehigh Valley Railroad has recently equipped two sections of its line with the telephone for train dispatching. The first circuit of this sort was put into service not long ago on the Mahanoy & Hazleton division, the dispatcher being located at Hazleton, Pa.

On the Mahanoy & Hazleton division there are ten siding telephones for use in cases of emergency. The entire equipment of the two circuits was purchased from the Western Electric Company, which manufactures all the telephones for the "Bell" companies.

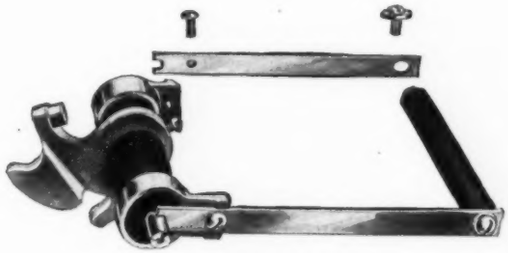
Gill main line bridging selectors are used in calling the way stations on the circuits now in use, of which there are thirty-five. In the way stations special equipment, composed of a swinging arm with the transmitter and receiver mounted in a fixed position on a yoke, is utilized. When the operator pulls the arm forward a special switch closes the telephone circuit. When he wishes to talk he depresses a foot switch, which closes the primary circuit through the transmitter. A storage battery is used for operating the circuits and dispatcher's transmitters.

New Electric Sign Flasher.

The Reynolds Electric Flasher Manufacturing Company has brought out an entirely new line of machine of such simple construction that it seems strange that it was not the progenitor of the sign flasher rather than an afterthought.

As shown in the illustration the switches are not closed and opened by cams, but by toothed wheels. The switches are strong and durable, and close into self-lubricated jaws of such ample proportion that any heat caused by an arc is quickly dissipated.

SWITCH JAWS.

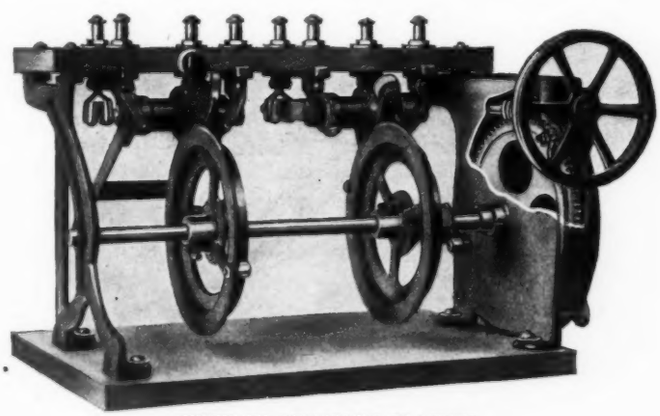


SWITCH BLADES.

These flashers have been in operation on overloads for the last six months and the switches and jaws show absolutely no sign of having been used, which would quickly show had the contacts been made and broken on poorly designed and ill-proportioned working parts. As shown, the worm gearing is entirely enclosed and runs in an oil bath, which eliminates all wear, the make and break is done by roller teeth, which also overcomes any undue friction.

This company now manufactures its flashers on methods which enable any broken or worn out part to be quickly and easily renewed should occasion so require. They are manufactured from the raw material in the company's own factory, not simply assembled, thus enabling improvements to be made quickly and also to keep cost directly under supervision, thereby keeping the price down.

The machines are put out under absolute guarantee that with a minimum amount of attention that they will run for years without repairs or renewals of any kind. With these new flashers all working parts are so designed that a novice can renew any part should an accident call for a renewal. All large flashers of the combination style are wired into lamps on a special test board and timed to give accurate lighting effects on signs for which they are intended before being shipped.



VIEW OF REYNOLDS FLASHER.

Comparison of the Great Fire Loss in This Country with that in Europe.

The direct loss by fires in this country is eight times as much per capita as in any country of Europe. The actual fire loss in the United States due to the destruction of buildings and their contents amounted in 1907 to $215,084,709, a per capita loss of $2.51. The per capita loss in the cities of the six leading European countries amounted to but thirty-three cents.

Two Types of Time Switches.

In the accompanying illustrations are shown two types of time switches which are being placed upon the market by the Campbell Electric Company, Lynn, Mass., and are meeting with approval wherever installed.

The instrument shown in Fig. 1 is known as type E, eight day, oil break, time switch and is made to control series street-lighting circuits. It will also break circuits of any potential up to and including 4,500 volts.

FIG. 1.—CAMPBELL EIGHT-DAY SWITCH.

The switch is mounted on a maple base and so supported that the cast-iron box which contains the oil can be removed without interfering with the switch proper. This iron case is lined with heavy insulating material and the terminals are brought out in such a manner that the switch is perfectly insulated in hot weather.

This type of switch is particularly adapted for central station use in controlling outlying districts.

Fig. 2 shows a view of the type A one day time switch which is intended for use where it is convenient to wind and set the clock movement each day. The clock movement is dust proof and enclosed in a highly polished nickel case, the iron parts are finished in aluminum bronze and the whole makes an attractive piece of apparatus. The switch is an on and off indicating snap switch. The clock is an alarm movement of standard make, and is said to keep accurate time.

FIG. 2.—CAMPBELL ONE-DAY SWITCH.

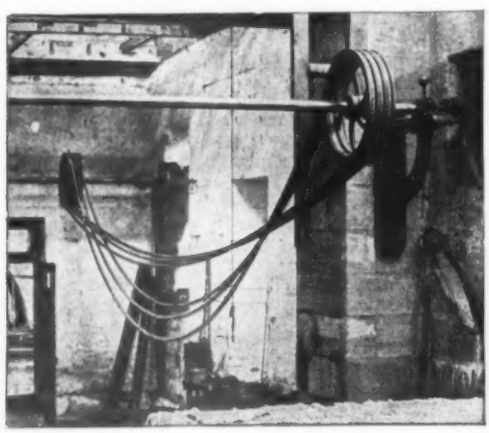
Type A switch is of a capacity up to and including thirty-five amperes, double or triple, and up to a pressure of 250 volts.

An Australian Rope Drive.

The rope drive installed in the Paramatta Woolen Mills, Sydney, N. S. W., as shown in the picture is rather odd in several ways. The three ropes are independent of each other (English System) and have stretched to such lengths that their slack parts sag far below and run in between the driving halves. The ropes run well in spite of contact with each other, and although such an arrangement may not be considered good practice, the extreme sag is beneficial to the extent that it materially increases the arcs of pulley contact.

It will be noted, too, that in spite of the stretch of ropes to unequal lengths, each assumes about an equal portion of the load, as shown by the similarity of the curves of driving halves. The equal distribution of the load was made possible in this instance by treating the ropes with Cling-Surface, made by the Cling-Surface Company, Buffalo, N. Y., to prevent surface slip and to preserve the interior of all kinds of driving ropes and belting. This drive demonstrates that ropes working on the English system if properly treated, can be made to deliver maximum power without regard to their looseness, and that the constantly increasing length due to stretch need not effect the distribution of the load among the individual ropes.

It might be added that a reliable anti-slip and preservative treatment, aside from the benefit to the ropes, is also desirable when the ropes are arranged to drive by the American system. In this instance the tighter grip of each strand on the pulley sheaves permits of a reduced initial tension on the drive.



AUSTRALIAN ROPE DRIVE INSTALLATION.

New Factory of the Belden Manufacturing Company.

The Belden Manufacturing Company, well-known makers of wires and wiring supplies for nearly all electrical purposes, has moved its offices, manufacturing and shipping departments to its new factory building at Twenty-third Street and Western Avenue. The mailing address is 2304 South Western Avenue, Chicago.

An idea of the size to which the company's business has grown is indicated by the accompanying illustration of the new building. Each of the six floors and basement has an area of 17,500 square feet, thus giving fifty per cent increase in floor space and better manufacturing facilities in every way over the former plant. The building is substantially fireproof and equipped with automatic sprinklers throughout. Along the west side of the building is a private switch track enabling direct shipping connection with every railroad entering Chicago.

THE BELDEN PLANT.

New Plant of the Toledo Electric Welder Company.

The Toledo Electric Welder Company moved its offices from Toledo to Cincinnati, Ohio, on February 4, and is now located in its new factory building at Knowlton and Langland streets, Northside, Cincinnati. The factory is fully equipped with the best and most modern tools necessary for the building of its line of welding machines, and the entire plant is motor driven. A seventy-five-killowatt single-phase generator supplies the power for testing the welding machines up to their full rated capacity. The shops are lighted largely by mercury-vapor lamps that are supplied by a motor-driven direct-current generator. Neil Macneale, the president of the company, states that owing to the number of orders received during the month of January, it will be necessary to put on a night force at once to take care of them and make the deliveries promised.

Trumbull Moulding Branch Blocks.

In the accompanying illustration is shown a view of a new design of a moulding branch block, with the cover removed, which is being placed on the market by the Trumbull Electric Manufacturing Company, Plainville, Conn.

These blocks are to be used for branches and are said to do away entirely with the objectional features of the old way. Their use eliminates the cutting of moulding channels and does not necessitate the soldering of joints. Also when using this fitting no wires are exposed.

For installing, the main line can be finished entirely by simply putting up a block wherever a branch is needed and then the branch can be finished. If it is necessary to examine the branch, the porcelain cover can be easily removed. These branches are made to fit all standard makes of moulding.

TRUMBULL MOLDING BRANCH BLOCK.

Light and Power for Airships.

An enterprising electric power company in Wisconsin shows, by its recently filed article of incorporation, that it is not only looking after its present welfare, but is making preparations for possible business in the future. This company has reserved for itself the privilege of purchasing and otherwise obtaining franchises to furnish heat, light and power to operate airships as well as tramroads, ropeways and electric lines.

Installation of Gas-Producer Plant.

In remodeling its generating station at Amarillo, Texas, the Amarillo Water, Light and Power Company installed a Westinghouse bituminous gas-producer plant for supplying its 300-horsepower Westinghouse gas-engine driven alternator set. This new bituminous type T producer is charged with coal costing $3.50 to $4.75 per ton, and delivers fuel gas having a calorific value of 110 effective British thermal units per cubic foot. The gas engine is of the single crank horizontal type, with a cylinder 18 by 26 inches, and delivers 300-brake-horsepower. Three-phase, sixty-cycle power, generated at 2300 volts, is used for local lighting and power in Amarillo. The development of a successful bituminous gas-producer plant has received the attention of the engineers of the Westinghouse Machine Company for several years, and in this direction severe and prolonged tests were carried out on the apparatus before the present highly successful bituminous producer was placed on the market. The results of these tests, both in the experimental plant at East Pittsburg, and in the installations which have since been put to active service, have conclusively proved the practical utility and economy of this bituminous producer for converting into gas the fuel properties of even such widely diverse materials as the leanest Texas lignite or the best Pennsylvania bituminous coal.

WITHAM PORTABLE TESTING BATTERY.

The Witham Portable Testing Batteries.

An ingenious arrangement of storage battery cells for use in potentiometer work, calibration of instruments, insulation tests, continuity tests and other purposes, is now being manufactured in this country by E. Marcuson, 136 Liberty Street, New York.

Any number of small cells are assembled in boxes to form batteries of any voltage desired. The batteries are portable in every sense of the word, the 100-volt, 168-volt and the 256-volt batteries weighing sixteen and one-half, twenty-seven and forty pounds, respectively. A special commutating switch permits of charging the batteries from 110-volt, direct-current mains. The elements, containers, separators and electrolyte are all visible, accessible and removable, and it is claimed that a battery need never be returned to the factory for repairs, as all parts can be renewed with perfect ease by anyone in a few moments.

The Witram testing batteries have been in use in this country during the past twelve months, and have been adopted by the Interborough Rapid Transit Company, the New York Edison Company, the United Electric Light and Power Company, the Postal Telegraph-Cable Company, and others.

The internal resistance of the cells being low, comparatively high rates of discharge are possible, thus an eight candlepower or a sixteen candlepower can be fully illuminated for a considerable time, thereby rendering the battery serviceable for making continuity tests of an installation before the main current is available.

These batteries are readily shipped, and the simple instructions for putting them into use are easily followed. Their cost is comparatively low. An idea of the size of the batteries will be gained from the accompanying illustration, which shows a man carrying a 100-volt and a 500-volt battery.

A New Electric Manufacturing Company.

The latest addition to the electrical selling organization of the West is the Delta-Star Electric Company, with offices and warerooms in the Stromberg-Carlson building, corner of Jackson Boulevard and Clinton Street, Chicago. H. W. Young, who recently resigned as sales manager of the Central Electric Company will assume the offices of president and manager.

The company will design and manufacture high and low tension specialties and the general policy will be that of a decentralized organization having highly trained specialists. Plans are being made for the organization of a selling policy, mention of which will be made later.

The president, H. W. Young, is well known to the electrical fraternity as a successful sales engineer of wide experience. His early training was secured with the Whitney Electric Instrument Company, Penacook, N. H., and with the Thomson-Houston Company, of Lynn, Mass. This was followed by commercial engineering work with the General Electric Company, at Schenectady, N. Y., and the sales management of the National Electrical Signaling Company, Washington, D. C.

H. W. YOUNG.

In 1904, Mr. Young joined the Westinghouse forces, being located in Boston, Mass., in charge of the detail and supply department, and transferred later to Pittsburg as special representative. In this capacity he secured a wide experience in the manufacture and sale of the many lines of supply devices handled by jobbers and supply dealers.

For the past two years Mr. Young has been with the Central Electric Company, as sales manager, during which time he has become well known throughout the middle West. As president of the new organization he will have an excellent opportunity to utilize his past experience and carry out his well-known ideas of specialization in the manufacture of electrical apparatus.

New Buildings for the General Electric Company.

It is understood that plans are under way for the construction of two more buildings at the plant of the General Electric Company, Schenectady, N. Y. Two more stories are also to be added to the office building.

Electric Vehicles—1910 Models.

Electric-vehicle makers in the United States are making a fine line of cars for their 1910 models, and all of them show improvements over the types of last year.

Perhaps the most striking developments are in the popular four-passenger broughams and coupés for town and city use, this year's models showing a decided tendency toward standardization along general lines. These cars as a general rule are slightly larger and roomier than heretofore, and the acme of comfort convenience, and reliability seems to have been attained. Further improvements will probably be in the storage batteries and much is expected of some recent types of cells which are being placed on the market.

Several companies seem to be departing from the conservative practice of limiting the capacity of their cars to local use, and are boldly asserting that the electric has already encroached on the field of the gasoline car for long-distance runs and hill-climbing capacity. These cars, as a rule, are built on similar lines to the gasoline runabout or roadster, this likeness being made possible by the assembly of all the batteries in front of the car, under a hood which is made very similar to that of the gasoline car, even to the copying of the honeycomb effect of the radiator in front.

Among the mechanical improvements effected in most of the various 1910 cars are the improved systems of brakes and the features which prevent the starting of the cars with the brakes on.

An interesting commentary on the relation of the central stations to the manufacturers of commercial electric vehicles is contained in the following abstract of a letter from G. P. Hutchins, advertising manager of the General Vehicle Company, of Long Island City and New York, N. Y.

"One little note that we might add as indicating the advantage that progressive central-station men find in developing commercial-vehicle business, namely that last Friday (January 28) we shipped to the Rochester Railway and Light Company twenty-four cars of 2,000 and 1,000 pounds carrying capacity, some of which are for their own use and some for private use, having been sold through their agency. This makes a total of about forty-five commercial vehicles which the Rochester Railway and Light Company has purchased of us, producing in the total a very satsifactory addition to their light load."

The following series of descriptions are of the 1910 models of the various companies listed:

ANDERSON CARRIAGE COMPANY.

The Anderson Carriage Company, Detroit, Mich., has made considerable expansion since last year this time, and has increased its manufacturing facilities by the purchase of the entire plant of the Elwell-Parker Electric Company of America, located at Cleveland, Ohio. This additional plant is used exclusively for the manufacture of motors, controllers and parts.

The 1910 "Detroit Electrics," as the cars of the Anderson company are named, are made in nine models, the heavier cars using the side-chain drive and the latter the tandem-chain drive. On the models "A", "B", "C" and "D" of the side-chain drive, the general outline will remain the same, while a few important improvements have been made. The wheel base has been slightly lengthened insuring even better riding qualities.

The entire power plant is rearranged by dropping the motor below the floor of the car, thus gaining the following very important points: (1) Eliminating motor noise inside the body. (2) Lowering center of gravity. (3) Allowing the equipping of a substantial emergency countershaft brake.

To the Model "L," with the tandem-chain drive, there have been added Models "E", "F", "G" and "H", and the chassis has been strengthened throughout, providing for a larger size battery, larger motor, and new double Renold chain drive housed in oil-tight casings.

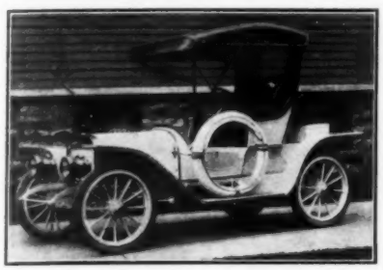
The steel cross members supporting the batteries on both chasses are rearranged so that all models at any time can be equipped with either the present lead or the new type Edison battery.

DETROIT ELECTRIC (BY THE ANDERSON CARRIAGE COMPANY), SUPPORTED ON INCLINED SKIDS BY ITS OWN BRAKES.

BABCOCK ELECTRIC CARRIAGE COMPANY.

The Babcock Electric Carriage Company, Buffalo, N. Y., manufactures a line of electric cars for which is claimed a mileage of 100 miles on one battery charge. The company calls especial attention to Model 12, a racy looking roadster which is hardly distinguishable from a smart gasoline runabout, and to Model 14, a typical four-passenger coupé, as being its newest and best liked types of cars. The wheel base of the former car is ninety-four inches, and that of the latter, eighty-six inches. The brake system is also different in the two cars, expanding and contracting hub brakes being used in the first car, and an external brake on the countershaft together with an expanding brake in

each rear hub, in the second car. The forty-two cell battery of the roadster is claimed to give a radius of 100 miles at seventeen miles per hour on one battery charge, under the best conditions, while the coupé is equipped with a thirty-three-cell battery made by the Babcock Company itself. Each car uses a fif-



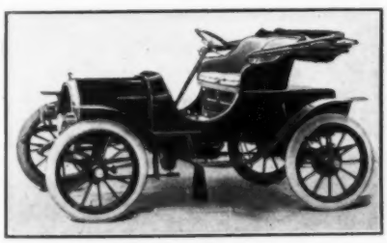
BABCOCK MODEL 12 ROADSTER.

teen-horsepower motor. An exclusive pattern of safety foot-control is furnished with the roadster controller, and the controller of each car provides for five speeds forward and one reverse. The coupé controller is also furnished with a foot control.

BAKER MOTOR VEHICLE COMPANY.

The Baker Motor Vehicle Company, Cleveland, Ohio, has made a new departure in this year's models by substituting for the chain drive a bevel-gear shaft drive, thereby following the practice which most of the gasoline-car manufacturers have adopted in recent years. The Baker company has hitherto used this drive only on its larger cars, but has now decided to use it universally.

The bevel-drive rear axle of the



BAKER RUNABOUT.

Baker electric is of the semi-floating type. To secure lightness and greater strength, the entire rear-axle housing is drawn from sheet metal. All the bearings in this axle are of the ball-bearing type. The axle shafts and drive shafts are made from special vanadium alloy steel, carefully heat-treated.

The differential is of a special type, and all gears in the rear axle housing, including the differential gears, have planed teeth and are hardened by a special process. The differentiating gears are mounted on a three-arm member and careful provision is made for self-alinement of the gears. The fit for all bearings is provided by grinding to limit gauges.

The entire front-axle hub is drawn from sheet steel and the hub pressings are accurately machined and fitted with ball bearings. The front-axle spring seats are machined from the highest grade steel and the tube is of special semi-spring temper steel with drop-forged yokes attached to the tubing by electric welding process.

A Renold silent chain (provided with an eccentric adjustment) and inclosed in an oil and dust-proof case is used on the reduction gear, insuring silence, flexibility and high efficiency.

The transmission shaft is constructed with two universal joints of the latest approved design, allowing absolutely free action of the rear springs.

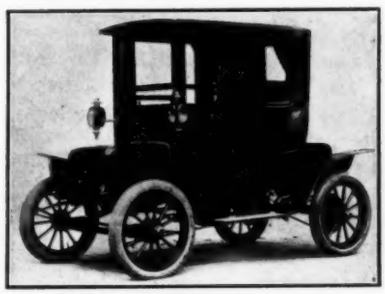
The motor is of a special four-pole design, series wound, with unusually large commutator. It is larger than the motors ordinarily used and possesses an electrical characteristic which makes it almost impossible of injury.

The patented controller is of the continuous-torque drum type with six speeds forward and three in the reverse, all controlled by one lever. No special pedals or switches are used. This controller is provided with a safety device which precludes the possibility of slipping into the reverse when shutting off power.

Another feature of the new models is the special lock (patent pending) for the controller. This device is extremely simple and is independent from any electrical connection, being purely mechanical and of absolute reliability.

The wheel base on the new models has been increased to eighty inches by moving the front axle forward farther than in the old models and extending the frame, making the cars ride more easily and steadily.

The bodies of the 1910 models are

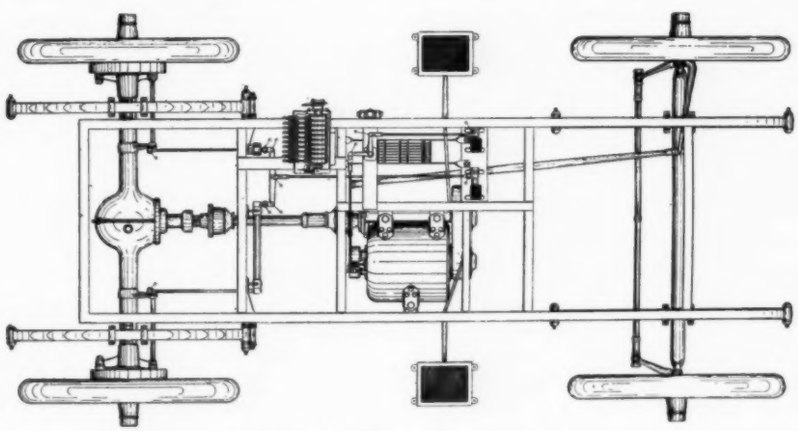


BABCOCK MODEL 14 COUPE.

more roomy, more comfortable and unsurpassed for elegance, style and beauty of design. All cars are equipped with continuous fenders.

The standard battery equipment for victorias and coupés has been increased from twenty-four cells to twenty-eight cells 9 MV Exide, in series at all speeds.

All new models are equipped with three brakes, two internal expanding brakes attached to the rear wheels which are lined with thermoid, insuring long life and absolute reliability,



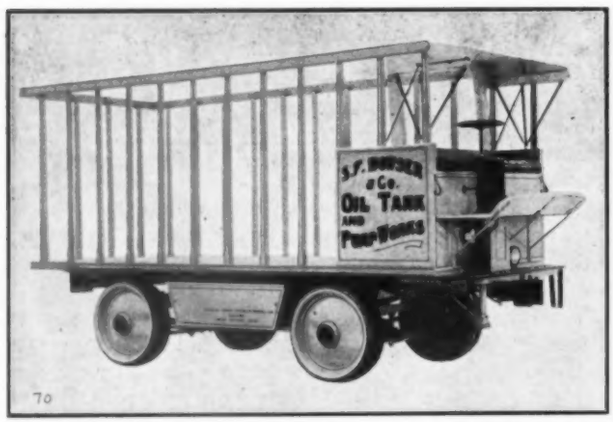
CHASSIS OF THE BAKER ELECTRIC.

and an emergency brake attached to the motor. All brakes are operated by steel rods, the expanding brakes on the rear wheels being controlled by one pedal with an equalizing bar inserted, which secures equal pressure on both brakes.

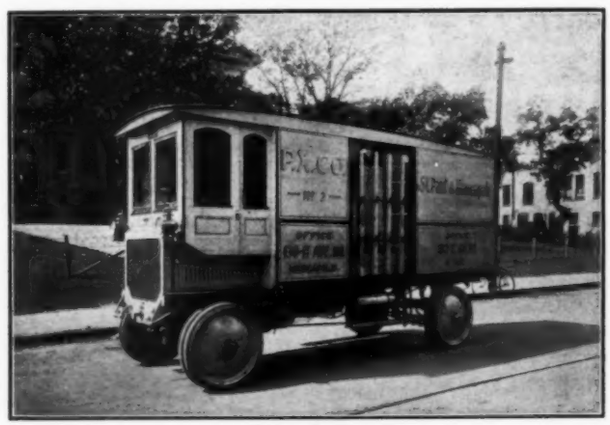
COUPLE-GEAR FREIGHT-WHEEL COMPANY.

The Couple-Gear Freight-Wheel Company, Grand Rapids, Mich., manufactures under the license of the Church Balance-Gear Company, Ltd., two types

of electric or gaso-electric trucks, one having a front-wheel drive (motor in each wheel) and front-wheel steer, and the other a four-wheel drive and four-wheel steer, the last-named feature enabling the car to turn a complete circle in its own length. These cars were described in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of February 13, 1909, and April 10, 1909. A further article describing a remarkable performance of the Couple-Gear electric truck will be found in our issue of June 12, 1909.



COUPLE-GEAR FIVE-TON BATTERY TRUCK—FOUR-WHEEL DRIVE, FOUR-WHEEL STEER.



COUPLE-GEAR 3½-TON GAS-ELECTRIC TRUCK—FOUR-WHEEL DRIVE, FOUR-WHEEL STEER.

The Couple-Gear Company is building battery-driven and gaso-electric trucks in three and one-half ton and five-ton sizes, and battery-driven trucks also in one-ton and two-ton sizes. The same transmission is used in both types of trucks. This consists of a motor in each driving wheel applying the power from both sides of the wheel and at the rim, as described in our previous issues referred to above.

The following report of a test of a Couple-Gear automobile truck wheel, by the Bureau of Standards of the United States Department of Commerce and Labor, Washington, D. C., will be of interest:

The wheel was driven by an electric motor inclosed entirely within it, so that the wheel with its inclosed rigidly attached gear racks formed the driven member, while the driving member was made up of the motor within the wheel, having a beveled pinion at each end of its armature, engaging the racks at the outer edge of the wheel, and carried by the armature shaft which had within it an equalizing device or "evener," the power being transmitted through this balanced driving unit at a reduction of approximately twenty-five to one, direct from the high-speed armature to the point of delivery.

The overall efficiency of the motor and wheel together was determined by a Prony-brake test. The wheel was then removed and the efficiency of the motor alone determined by a second Prony brake, but with all other conditions as nearly alike as possible. Records were kept of the current and voltage supplied to the motor field and only those readings were used in the calculations which showed that the field winding had the same resistance, and hence the same temperature in the two tests. The applied voltage was held at 100 in all cases.

The accuracy of the measurements was limited by the nature of the test to about one per cent.

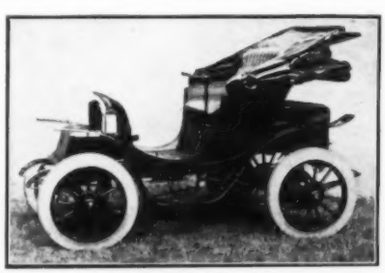
Current in amperes.		Efficiency of motor and wheel.
25	(75 per cent of normal load)	76 per cent
33	(Normal load)	76 per cent
50	(50 per cent overload)	72 per cent

The average value found for the power absorbed in the transmission gears and roller bearings of the wheel for the three different loads above specified was two and one-half per cent of the total power delivered to the wheel by the motor. That is, the average efficiency of the transmission gear was 97.5 per cent.

THE RAUCH AND LANG CARRIAGE COMPANY

The Rauch and Lang Carriage Company, Cleveland, Ohio, has a fine line of twenty-four, thirty, and forty-cell electric cars this year, fully in keeping with the best traditions and previous record of the company.

Among the special features of these cars are the motor and the controller.



STUDEBAKER ELECTRIC VICTORIA-PHAETON, MODEL 17D.

The motor is built to a different design from that of any other electric vehicle motor now on the market, inasmuch as instead of having only a simple series winding it has in addition a differential shunt winding which is used to speed up the motor when the highest velocities are required.

The controller is unique in design, and is mounted in a flat aluminum case contained in a fireproof compartment under the seat. The controller is of a flat type and has one arm with two contact members which sweep over replaceable contacts arranged in the arc of a circle.

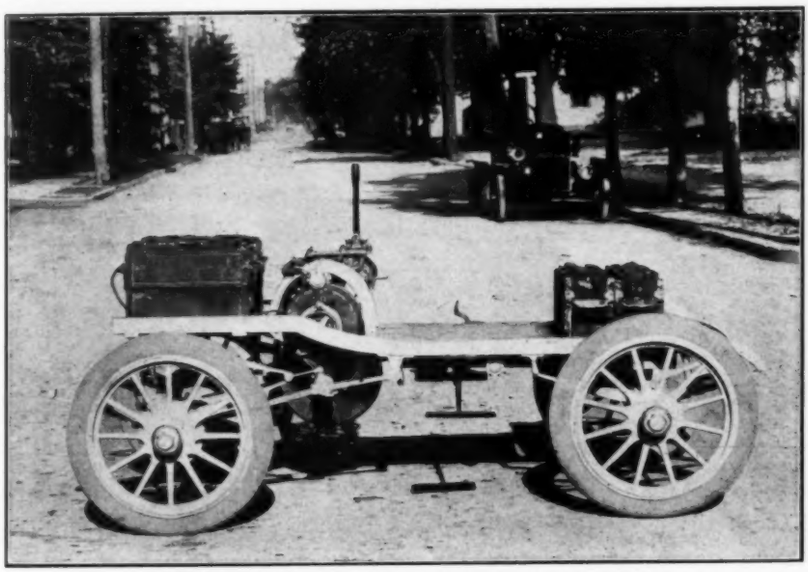
Another point of interest in the Rauch and Lang electric is the method of working the batteries. By keeping the bateries always in series (a pressure of eighty volts is used) all of the cells are equally used, and therefore in charging there is no danger of undercharging some of the cells and overcharging others, as is apt to be the case when the battery is used at times one-half at a time.

STUDEBAKER AUTOMOBILE COMPANY.

The Studebaker Automobile Company, South Bend, Ind., in its fine line of Model 17 cars for 1910, has evolved a type of car in which one of the chief points is the ease of entry and exit of the passenger, this having been effected by bringing the step of the car as close to the ground as possible without undue sacrifice of other important features. Elegance, reliability, and safety have professedly and designedly been more emphasized in these cars than speed and mileage capacities, thereby keeping the Studebaker electric within its true province as a car for park and city work, both for pleasure and business purposes. The Studebaker Company reports that it has no season models, but that it makes changes on its cars any time during the year as may seem advisable. The specifications for the Model 17 cars,

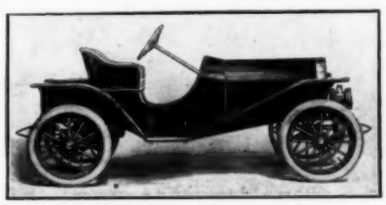
which are made with various types of bodies, are as follows:

Motor. One, special type, with ample overload efficiency to carry car over any reasonable grade.—Battery. Twenty-six cells of eleven-plate Exide battery, part carried in front and part in rear, equalizing the distribution of weight.—Speed. Landaulet, four to twenty miles per hour. Coupé, four to twenty miles per hour. Phaeton, five to twenty-one miles per hour.—Wheel base. Seventy-one inches.—Wheel diameter. Thirty inches. —Ties. Front and rear, thirty by three and one-half inches, pneumatic.—Brakes. Foot level controls brake on rear axle. Another brake on armature shaft is operated by controller handle.—Body. The body is designed along the most graceful lines, at the same time taking carefully into consideration the comfort of those riding. The interiors of the coupé and landaulet are commodious and luxurious.—Equipment. Volt-ammeter with light, two side lights, tail light, necessary tools, tire pump, tire repair outfit, charging plug with fifteen feet of cable. Phaeton equipped with either gypsy quartered or Victoria leather top. Landaulet is furnished either with folding or standing front.



CHASSIS OF STUDEBAKER ELECTRIC AUTOMOBILE.

WAVERLEY MODEL 70-C VICTORIA-PHAETON, WITH REMOVABLE COUPE TOP.



WAVERLEY ROADSTER, MODEL 78.

THE WAVERLEY COMPANY.

The Waverley Company, Indianapolis, Ind., reports that its 75-C, four-passenger brougham leads all its other models in sales this winter, and that it attracted considerable attention at the recent automobile show at New York city. The distinctive feature of this car is the copyrighted drop sill, which makes possible the combination of a true victoria body with a removable brougham top, making a very satisfactory and artistic arrangement.

The carriage is operated from within, the steering lever and interlocking controller being at the left of the rear seat, with the voltmeter and double foot brakes immediately in front. Accident-proof, trouble-proof, practically foolproof, is the character given to the Waverley controller, the simplicity of operation and absolute safety of which may easily be demonstrated.

The driving mechanism of the silent Waverley is a transverse shaft drive attached to the body, completely encased and protected from dust and dirt, and running in a continuous bath of oil. The power is transmitted from the motor through a silent flexible gear to the transverse shaft and thence by a herringbone gear to the floating rear axle. Efficiency, noiselessness and a complete absence of trouble are the characteristics of the Waverley transverse shaft drive, which is attached to all the new Waverley models.

The silent Waverley motor is larger than most other electric carriage motors and is built with unusual strength of parts, great efficiency and remarkable overload capacity.

Choice of Exide, Waverley or National batteries is afforded with Waverley carriages, and in Model 75-C the battery is divided twenty cells in the rear compartment and twelve cells in front, all of eleven or thirteen plates as specified.

In this respect the mechanism of the brougham differs from that of the new Waverley roadster, Model 78, a thoroughly unique car built on the lines of a gasoline runabout. The peculiar racy effect of this "man's electric" is obtained by combining thirty-two cells of battery all under a long front hood. The wheel steer also distinguishes this car from other Waverley models in all of which the side-lever steer is given the preference, though the Waverley factory is in a position to equip any of its cars with steering wheels if desired. Back of the roomy two-passenger seat of the roadster is a tool box surmounted by a folding rumble seat which makes this car accommodate three passengers with ease and comfort. With the exception of the differences noted the mechanism of the roadster is the same as that of Model 75-C; but it is equipped for a speed of twenty-five miles an hour when desired. The car has a long wheel base for an electric, viz.: ninety-four inches, and the length of the body is 108 inches. It is ironed for a mercerized cape top, and supplied with a wind shield when required.

Model 70-C, two-passenger coupé, is finished and furnished with the same care, taste and completeness as the Waverley brougham above described. It is a carriage of solid popular qualities with a record of fine achievements in regular service as well as in cross country stunts.

Another favorite Waverley model is the Model 74 stanhope, with buggy top, straight sill and solid tires, a carriage of unusually distinguished appearance and thoroughly practical qualities, having ample protection for stormy weather. This car is especially popular with professional men for town and rural service.

WOODS MOTOR VEHICLE COMPANY.

The Woods Motor Vehicle Company, Chicago, Ill., manufactures an electric car (new Model 1012) of the type shown in the accompanying illustration. The following are the specifications of this car, as submitted by the company.

Body, inside operated; capacity, five passengers. One motor of sufficient

WOODS ELECTRIC BROUGHAM.

horsepower to climb 25-per-cent grades and also of such heating capacity that the battery is discharged before the motor is dangerously warm. The batteries, forty cells, type 9 M. V., twenty cells located under front hood and twenty cells under rear hood. Hoods made of sheet aluminum. Four speeds forward, two reverse by selected type. First reduction by means of herring-bone gear. Final drive side chain. Wheel-base, eighty-eight inches. Tread, four feet, eight and one-half inches. Frame material, armored wood and Parsons' manganese bronze. Motor bearings, D. W. F. Transmission bearings, D. W. F. Axle bearings, D. W. F. Weight, 3,000 pounds. Tires front, thirty by two and one-half inches, solid rubber special composition. Rear, thirty-four and two and one-half inches, same. The car has full platform springs made of nickel-chrome steel. Axles front and rear, I-beam, one-piece nickel-chrome steel forgings. Steering knuckles, inverted Elliott type with D. W. F. thrust bearing. Larger brakes than last year. Batteries arranged differently with special hold-down, making them immovable. Controller has Yale lock and interlocking cut-off switch.

THE ELECTRIC COMMERCIAL VEHICLE AT THE CLOSE OF 1909.

BY J. H. VAIL.

In the business progress of electric vehicles the year 1909 has witnessed a distinct advance. The closing year marks the record that recognition is already given to the importance of electric commercial vehicles as the most efficient and economical solution of the problems of city hauling.

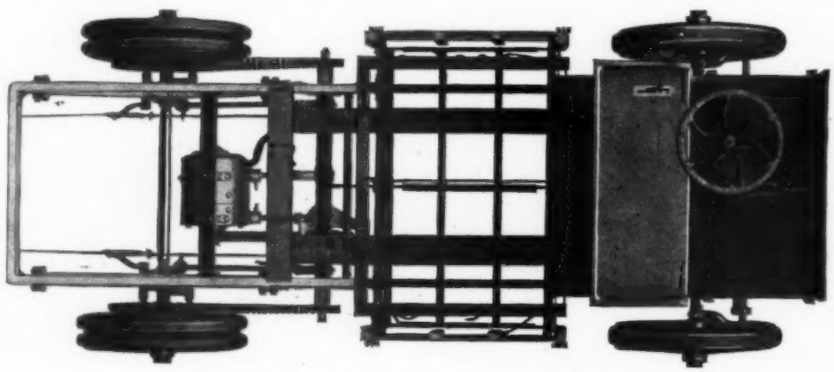
The more progressive central stations already recognize the growing value of this new field for selling current, the importance of which was previously unsuspected.

The most up-to-date business concerns are interested in the investigation of their costs of teaming and are aiming to introduce the more economical methods of electric commercial trucks and delivery-wagon service.

Electric runabouts, victorias and coupés are admitted by all users to be par excellence for safety and reliability for business calls and domestic service, and a mark of the social standing.

At the close of 1908 there were five central stations using electrics in their daily operations. Compared with this we find, at the close of 1909, that central stations in the following cities have adopted electrics: New York, Brooklyn, Philadelphia, Boston, Rochester, Buffalo, Cleveland, Atlantic City, Chicago, Des Moines, New Bedford, Cedar Rapids, Davenport, St. Louis, Rio de Janeiro.

There can be no doubt of the awakened interest on the part of progressive business concerns in those cities where the electric-light company takes the lead. The annual income to electric-light companies from charging electric vehicles now ranges from $500 to $50,000 per year. This must continue to be a growing feature of interest to all such companies.



PLAN OF CHASSIS OF GENERAL VEHICLE TRUCK.

GENERAL VEHICLE MAIL WAGON.

The following is a correct statement of kilowatt-hours of current sold by meter for charging electric vehicles by one company active in this field of enterprise in a city of less than 300,000 population:

In 1906 average monthly consumption 23,828 kilowatt-hours.

In 1909 average monthly consumption 46,720 kilowatt-hours, or for the years 1906 to 1909 inclusive, 1,749,373 kilowatt-hours sold, exclusive of current used for the company's own vehicle service.

It is an important fact recognized by all that this revenue is profitable in a larger degree than any other service supplied for two leading reasons, as follows: (1) The income is derived during hours of minimum demand that were hitherto unprofitable. (2) No company has been obliged to invest any new money in station equipment to serve this class of business.

What other kind of business can be named that will introduce like conditions to any electric light and power company?

Of the total number of commercial electrical vehicles in use the General Vehicle Company, the general offices of which are located at 505 Fifth Avenue, New York City, has manufactured upwards of 1,600. These electric vehicles embody the adoption of all the valuable features that make for reliability, economy, durability, general excellence in simplicity of design, and highest class of workmanship and materials.

The rejection of hundreds of ideas that have been found impracticable, or that for any reason would in some detail have reduced the value of the machine to its owner is best evidenced by the readiness of the General Vehicle Company to give to its customers a guarantee contract limiting the annual cost of upkeep for a period of years within a fixed sum. This at once eliminates all uncertainty on the part of the owner as to what may be the cost of maintenance of tires, wheels, chains, axles, bearings, springs, steering gear, controller, motor and battery.

The General Vehicle Company appreciates the importance and profits by the experience of being in frequent touch with its customers through the inspectors of its engineering department.

There is a growing appreciation of the economic value of the cardinal features of excellence of the electric commercial vehicles of the General Vehicle Company. These salient points are the one motor drive, roller bearings, enlarged battery capacity, and a conservative rating based on a liberal factor of safety throughout all details of the vehicle. The combination of these features results in a marked reduction in weight, an increased mileage per battery charge, reduced battery maintenance and an increase in efficiency over electrics using two or more motors.

It is recognized that the large adoption of the electric commercial vehicle must come through the education of the central-station manager to the value of the vehicle as a revenue producer and of the business men to the advantages in reliability, economy and utility. There exists with both a large "Missourian" population requiring visual demonstration.

What better can the electric-light company require than a new source of profitable revenue, or the business man for whom the electric commercial saves money? This whole matter is not sentiment; it is a proposition of dollars earned by enterprising progress.

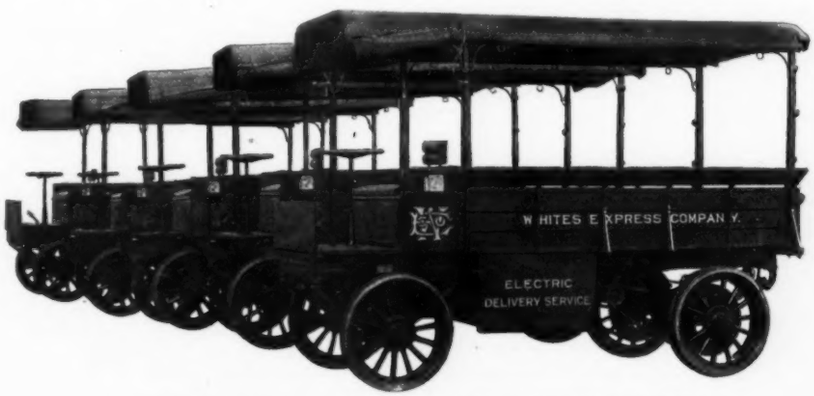
From the many evidences of the advance of electrics in the favor of the business public, a few are selected for illustration.

The White's Express Company, of Brooklyn, operates four two-ton trucks and six three and one-half-ton trucks. These trucks in daily service each deliver their full load capacity of goods, making as high as 250 delivery stops per truck in daily trips of from thirty-five to fifty miles. The estimated supply of current is from 85,000 to 100,000 kilowatt-hours per year.

The Motor Delivery Company as mail contractor in New York city operates sixteen electrics of 1,000 pounds, 2,000 pounds, 4,000 pounds and 7,000 pounds load capacity; during the recent holiday period several extra machines were

GENERAL VEHICLE DELIVERY WAGON.

GENERAL VEHICLE BREWERY TRUCK.



GROUP OF GENERAL VEHICLE ELECTRIC EXPRESS TRUCKS.

pressed into service. The quantity of mail hauled, the promptness of delivery and the aggregate excellence of the electric mail service exceeded all previous experience of the New York post office.

Purchasers of delivery wagons of 1000 lbs. and 2000 lbs. capacity frequently order five to twenty-five wagons per customer.

Department stores and others find they can rely on making from 100 to 200 delivery stops per wagon in circuits of forty to fifty miles on a single charge of battery. The amount of current for a full charge for the 1000-pound wagon is nineteen kilowatt-hours, and for the 2000-pound wagon, twenty-three kilowatt-hours.

The five-ton truck is one of the brute type of commercial electrics. Many of the prominent brewers have demonstrated the economic advantages of electric delivery service. Early orders of 1902 and 1903 have been followed by repeat orders from year to year, so that many of the brewery equipments comprise the early, as well as the most recent, types of vehicles.

The three-and-a-half-ton and five-ton trucks are used for a great variety of heavy trucking. The amount of current for a full battery charge for the three-and-a-half-ton truck is thirty-nine kilowatt-hours, and for the five-ton truck, forty-seven kilowatt-hours.

There is every evidence that the electric commercial vehicle has come to stay. The gradual emancipation of the horse from the strenuous life consuming work of hauling city traffic, increased street space, improved sanitary conditions and decrease of street noises are visions of the not far distant future.

North Texas Electric.

A special meeting of the stockholders of the North Texas Electric Company, which owns the entire capital stock of the Northern Texas Traction Company, has been called to authorize an issue of $10,000,000 collateral trust five per cent bonds, approximately $1,100,000 of which will finance improvements and additions to the plant of the traction company and to retire its $500,000 six per cent notes due May 1, 1911. Two and one-half millions of the bonds will be reserved to be exchanged for the same amount of first mortgage five per cent bonds of the traction company.

Economy of Electric-Vehicle Business to the Central Station.

The General Vehicle Company, of Long Island City and New York, N. Y., has recently prepared an instructive table (given below), which shows a comparison of the economy produced to the central station by electric-vehicle charging as compared with other industrial uses of electricity. The cars named in the table are those made by the General Vehicle Company.

Estimated annual kilowatt-hours average demand of individual electric vehicles, compared with the number of arc lamps, incandescent lamps, or flat irons of equivalent kilowatt-hours demand.

Type of vehicle	Estimated kilowatt-hours average annual demand	No. of 550-watt arc lamps four hours daily 300 days	No. of fifty-watt incandescent lamps one hour daily 300 days	No. of flat irons three hours per week
5-ton truck	11,280	17	752	144
3½-ton truck	9,360	14	624	120
2-ton truck	7,440	11	496	95
2,000-pound wagon	5,520	9	368	70
1,000-pound wagon	4,560	7	304	58
Domestic vehicles	2,400	4	160	30

The Connecticut Magneto.

The Connecticut Telephone and Electric Company, Meriden, Conn., through its sales representatives, the United Manufacturers, New York, has just placed upon the market a new type of high tension magneto. This magneto

THE CONNECTICUT MAGNETO.

attracted considerable attention in New York at both the Grand Central Palace and Madison Square Garden shows. The Connecticut magneto is built along conventional lines, but is said to have many new improvements. This magneto will produce a good sized spark at the slowest possible engine speed, in fact, the manufacturers claim that the engine can be started on one quarter turn of the starting crank. Spinning is not necessary. This point will be invaluable for boat as well as automobile work for it means that an automobile can be driven through crowded streets and around corners at slow speed making it unnecessary to change gears, or switch over to the batteries.

The Connecticut magneto has all the advantages of the double wound armature type of magneto and the low tension type with separate coil on the dash. The transformer coil screws into the bow of the magnets in cartridge form so in case of a burn out or break down, immediate repairs can be made by simply inserting a new coil, same as substituting a new unit in a spark coil. The magneto is fully enclosed so it is water and dust proof. It can also be changed from right to left running by simply changing three screws.

The Connecticut Company has greatly simplified the construction, by reducing the number of parts. These parts can be changed in the dark as there is only one way for them to fit so they cannot go together wrong by the inexperienced automobilist. This magneto cannot be short circuited by too much oil as there is a special drain which carries off all excessive oil except the proper amount which should be used. A unique feature is that four safety gap windows are used, and in case one of the cylinders is missing, the spark will immediately begin to jump across one of the windows, so that the opertor can note at a glance in which cylinder there is trouble.

This magneto is of thoroughly high grade workmanship in every particular and equal in every respect to the foreign made product, with the advantages of simplicity, accessibility and higher efficiency. It is fitted with the highest grade imported ball bearings throughout.

Electrical Iron-Smelting in Sweden.

It is reported in the Swedish newspapers that a company is being formed for the electrical smelting of iron ore in Norway. The Gronwall patent is to be used in this connection, and the furnace will be located at Hardanger and will utilize energy to the extent of 4,400 horsepower from the power station at Tysse. The company is capitalized at $292,800.

Current Electrical News

GREAT BRITAIN.

(Special Correspondence.)

LONDON, JANUARY 28.—The appeal of the Westinghouse Company against the decision of the Chancery Court that the Bremer arc-lamp patent was anticipated by a patent of Graham is now being heard. The effect of the decision of the Chancery Court was to render the Bremer patent invalid, inasmuch as it was held that there was no subject matter in the invention for patent. The matter is being thrashed out in great detail in the Appeal Court, and if impressions go for anything, the Court would appear to be favorable to Bremer.

One of the best known set of electric wiring rules in this country is that of the Phœnix Fire Office. Indeed, these rules go hand in hand with those of the Institution of Electrical Engineers. As a result of the recent disastrous fire in a drapery establishment at Chapham, caused by the breaking of an electric lamp and the setting fire to cotton, wool and celluloid combs, the Phœnix Company has revised certain of its rules. No flexible may now be use in shop windows and in no case arc-lamps to be placed near any goods. This company has frequently acted upon the advice of its electrical engineer and refused to insure premises owing to badly designed window lighting. Hitherto flexible has been permitted for temporary installations, but this rule has now been withdrawn, and another added which prohibits flexible, under such circumstances.

The affairs of the London Electric Company seem to be under a cloud just now. It has been noticed for some time past that the number of buses on the streets has considerably diminished, and now it is announced in the financial papers that the assets of the company have been transferred to another company. Coupled with this announcement has been a strong warning to the public to keep clear of investing further money in the company.

The Census of Production Act passed in 1906 made it incumbent upon manufacturers in Great Britain to supply particulars of their output each year. The figures for 1907 are now available, and it will be seen that the total electrical manufacturers amounted in value, at the factories, to $69,000,000. Of this, motor-generators, converters, transformers, switches and switchgear, accounted for nearly $21,000,000; while cables of all classes were manufactured to the value of $16,755,000. Exports of electrical machinery during 1907 amounted to $17,390,000. Imports of heavy electrical machinery were equal to fourteen per cent of the amount manufactured in the country; electrical apparatus was equal to twenty-six per cent; telegraph and telephone cables eleven per cent; and wires and cables five per cent.

It is announced that the Victoria Falls Power Company has issued in Berlin, further debentures to the value of $4,500,000.

In consequence of the recent fatal accident on the District Railway, when an electric train dashed into some station buffers, owing to the failure of the brakes to act, the Board of Trade has made some recommendations to the railway company in regard to training conductors into a better understanding of the Westinghouse air brake. The Board of Trade also urges the company to maintain a stricter discipline, as it is clear that on the morning of the accident in question the train was taken out of the depot with no air in the brake system. G.

CONTINENTAL EUROPE.

(Special Correspondence.)

PARIS, JANUARY 25.—The city of Naples is to secure a large amount of current from a hydraulic plant which will be erected at the sources of the Volturno. A decree has recently been passed which gives the city the rights for these sources, and the plans for the hydraulic and electric work are now being drawn up in the municipal offices. The water from the sources is first received in a number of basins and from these there will be built a flume of one and one-half miles length ending in a settling basin from which three penstocks are to lead down to the turbine station. Here will be installed a number of three-phase 5000-volt alternators, and the voltage will be raised by transformers to 45,000 volts for operating the power lines. The station is fifty-five miles distant from Naples in a straight line, and it is intended to run a double power line, using two sections of three wires each. About 10,000 horsepower can be obtained in this way. At Naples there will be erected a substation containing transformers for lowering the tension to 6,000 volts, and the current will be distributed within the city by underground mains and also in the suburban region by overhead lines.

Electric traction is to be developed to a considerable extent in the southwestern part of France in the region of Bayonne, and the lines will run as far as the Spanish frontier. Two different syndicates have the matter in hand, and it is thought that they may consolidate in order to carry on the work to better advantage. The first syndicate wishes to build a line from Biarritz to St. Jean de Luz which will run along the coast and then join on to the line for which the same company has already received the concession namely the one running from St. Jean de Luz to Peyrehorade. The second company a Belgian firm, already owns the rights for a line leading from Biarritz to Hendage on the frontier, and it desires to run a new electric road from St. Sebastian (Spain) to Irun. It is now making negotiations to buy up all the electric tramway lines in the city of St. Sebastian.

In Austria there is an extensive project on foot for regularizing the course of the Drave and thus securing a large amount of power for the city of Budapest. This work will be difficult to carry out owing to the swift flow of the stream and the great irregularity of the output. There is a question as to whether the profits will cover the expense. Among other Austrian projects I note that an electric railroad is to be built from Andritz to the summit of the Schoeckelberg, and a tramway system is to be installed in the town of Teschen. A. DE C.

EASTERN CANADA.

(Special Correspondence.)

OTTAWA, ONT., February 5.—The town of Preston, Ont., has passed a by-law to raise the sum of $18,000 for the installment of the hydroelectric plant.

The city of Port Arthur, Ont., has just given another evidence of its progressive spirit in the purchase of the Bell Telephone Company's franchise. The city has purchased outright the franchise and all the rights of the company to poles and overhead work on the streets, the only privilege the company retains being the right of connection with the municipal central station for long distance calls.

The Toronto Railway Company, during the year 1909, made net earnings of $1,930,913, an increase of $253,466 over the net earnings of the year previous. This is a record. The net increase in passenger earnings was 12.19 per cent. The operating expenses were also reduced by 1.5 per cent. The city's share of the receipts aggregated $640,201, an increase of $61,286.

When the charter asked for by the St. Lawrence Power Company, backed by $1,000,000 capital, comes before the International Waterways Commission for consideration, the Ontario government, through the chairman of the hydroelectric commission, will demand the insertion of a provision for the control both of the quantity of power to be exported to the United States and the price to be charged therefor. It is understood, also, that the local government will ask for the placing of the power concern under the authority of either the hydroelectric commission or the Dominion railway commission.

At the annual meeting in Montreal of the Shawinigan Water and Power Company, the statement showed that the gross earnings of the company for 1909 were $819,171, operating expenses $118,048, bond interest $379,816, and the net revenue $371,306. The company has made many important extensions during the year, and has also purchased new securities of other concerns. The gross earnings of the company have increased from $357,147, in 1906, to $819,171 last year. A striking feature of the annual report was the statement that the company will be able to utilize water power at Shawinigan Falls capable of developing, at all times, 150,000 horse power. What this huge production will mean to the company can be better understood when it is pointed out that only 55,000 horsepower is now the developed capacity of the power plant at Shawinigan Falls.

The estimates for the current year, laid before the Ontario legislature this week, contain the sum of $2,500,000 for the hydroelectric transmission line from Niagara Falls. In addition to this $50,000 goes to the building of the Port Arthur transmission line. The provincial treasurer said: "We are not manufacturing power. We are beating the trusts. It is necessary that the government should interfere, and this government is transmitting but not manufacturing power. The government will not allow any profit on watered stock at the expense of the people. Every municipality in the province benefits even before we deliver power." W.

MEXICO.

(Special Correspondence.)

MEXICO CITY, MEX., FEBRUARY 7.—The Guanajuato Power and Electric Company and the Chapala Hydroelectric and Irrigation Company have entered into a written agreement whereby the territory of central and western Mexico is apportioned between them for the operation of their respective power transmission lines.

The electric generating plants of these two concerns are situated about 150 miles apart, but with the expansion of their transmission lines their business interests began to clash. There was a brisk competition between them as to which should obtain control of the electric power business of the state of Aguascalientes. The Chapala Hydroelectric and Irrigation Company won the fight there and was after an exclusive concession for furnishing electric power in the states of San Luis Potosi and Zacatecas when a mutual agreement was reached as to division of the territory. The contract was signed by Henry Hine, president of the Guanajuato Power and Electric Company, and Emile Pinzon, director general of the Chapala Hydroelectric and Irrigation Company, on behalf of their respective concerns. It is provided that the power and lighting business of the states of Jalisco, Michoacan, Aguascalientes, Guanajuato, Zacatecas and San Luis Potosi shall be divided on an equitable basis between the two companies. The agreement provides that the Guanajuato company shall construct a transmission line to San Luis Potosi and the Chapala concern shall extend transmission lines to the cities of Auguascalientes and Zacatecas, the former to consume 10,000-horsepower and the latter 6,000-horsepower. The line to Aguascalientes will be 110 miles long and that to Zacatecas about 190 miles long. The Guanajuato Power and Electric Company will cover a portion of the state of Jalisco with its lines. It will meet the Chapala company's lines at Ocotlan on Lake Chapala. It already has a low voltage line to Ocotlan from its Zamora hydroelectric plant. This line will be changed to high voltage. The two systems will connect and under the terms of the agreement will furnish each other with electric power when necessary. The agreement also establishes uniform prices for the services of the respective companies.

An official report has just been issued by the street railway department of the Chapala Hydroelectric and Irrigation company which shows that 6,400,000 passengers were carried by its electric lines in this city during the year 1909. This is an increase of 1,460,000 passengers over the previous year. Plans have been adopted for the construction of important extensions of the system during the present year. The proposed extensions will run to the suburbs of Guadalajara, and over streets in the outskirts of the city that are not now occupied. The material for a portion of this new work has already arrived.

The Alfred B. Adams Company, of the City of Mexico, has made plans for the erection of a large hydroelectric plant on the Balsas River. It is estimated that 60,000-horsepower can be developed under the concessions already held from the government. It is proposed to transmit the electric power to the City of Guerrero and to several towns and mining camps in this part of the country. D.

LIGHTING AND POWER.

(Special Correspondence.)

NEWPORT, CAL.—The city has voted to issue $25,000 bonds for an electric lighting plant. A.

POCAHONTAS, OKLA.—This city has voted bonds for $14,000 to establish an electric light plant. P

HAMBURG, ARK.—This city has issued bonds for $30,000 with which to establish an electric light plant. P.

ORLAND, CAL.—The Northern California Power Company will extend its power line south from Hamilton City to Jacinto, Cal. A.

MADISON, S. D.—The city has formally accepted the new electric light and gas glant, which was completed at a cost of $25,000.

WOODWARD, TEX.—J. S. Sweet, of San Antonio, Tex., and others propose to construct an electric light and power plant in this city. P.

ELYSIAN, MINN.—The Cannon Valley Electric Light and Power Company has applied for a franchise to furnish light and power here. P.

LOS ANGELES, CAL.—The town of Lompoc is planning to purchase the electric light plant and system managed by J. T. Worthington. A.

RED BLUFF, CAL.—W. F. Luning has filed a notice of a claim of 12,000 inches of water in Mill Creek to be used for generating electricity. A.

COMPTON, CAL.—The City Council has passed an ordinance granting the Consolidated Utilities Company an electric lighting franchise in this city. A.

EUREKA, CAL.—The city of Eureka has filed claims on water rights in the Mad River and in the Bug Creek for power for municipal purposes. A.

MEMPHIS, TENN.—The Binghamton Light and Power Company has entered into a contract to supply the Shelby County Poor Asylum with light and power.

DIXON, CAL.—Sealed bids will be received March 1st for a franchise to erect poles and set wires for transmitting electricity along the streets of the town. A.

WINDHAM, O.—The Windham village council granted a franchise to the Windham Electric Company for constructing an electric light and power plant here.

LAS CRUCES, N. M.—J. B. Downey, representing Eastern capitalists, will purchase the Las Cruces Electric Company. G. W. Morgan will hereafter be in charge. A.

MONTGOMERY, ALA.—The city has purchased for $15,250, a site on which to erect a new reservoir. The water is to be pumped by electrically operated machinery. B.

SONORA, CAL.—A notice of appropriation of 20,000 inches of the Main Tuolumne River waters for power and irrigation purposes has been filed by Drenzy A. Jones. A.

PORTLAND, ORE.—The Hood River Light and Power Company has been incorporated with a capital stock of $2,000,000, by John D. Wilcox, Wirt Minor and Q. R. Smith. A.

LONG BEACH, CAL.—The Edison Electric Company will build its proposed $1,000,000 plant at Long Beach, Cal., as soon as it receives certain concessions from the city as to the site. A.

SACRAMENTO, CAL.—E. Oppenheim has sold to the American River Company, the electric distributing plants at Florin and Elk Grove, including about twenty-five miles of pole line. A.

SANTA MONICA, CAL.—The Rand Power and Irrigation Company, with a capital stock of $10,000, has been incorporated by H. H. Grisby, R. M. Miller, H. J. Englebrechr and Mr. Ehrman. A.

PHOENIX, ARIZ.—On February 24 an election will be held to determine whether or not Congress shall be asked for authority to issue bonds not exceeding $300,000 for acquiring an electric lighting plant. A.

YAKIMA, WASH.—The Wenas Electric Power Company has been incorporated at North Yakima, Wash., with a capital of $15,000 by T. V. Sanders, S. J. Anderson, P. C. Weinman, M. B. Miles and E. G. Townson A.

INDIANAPOLIS, IND.—The new administration is planning to construct a municipal lighting plant. The estimated cost of the plant under consideration is $1,000,000. The city council has the matter in charge. S.

BIRMINGHAM, ALA.—Birmingham Railway, Light and Power Company are reported to be contemplating expenditures of $500,000 improvements in power house and electric, gas and steam-heat departments. B.

SANTA FE, N. M.—The Rio Lucero Power Company has secured the right to extend its lines and to transmit power throughout the county. The company will furnish light to Taos and neighboring points. A.

KAYSVILLE, V.—At a recent meeting of the Davis County Light and Power Company, the following directors were elected: Lambert Beamires, Daniel Bodily and William I. Layton. Mr. Blamire is president of the board.

GARY, IND.—The Buffington plant of the Universal Portland Cement Company is to be operated entirely by electric motors. The capacity of the plant is 2,000,000 barrels of cement a year. Power is to be transmitted from Gary.

GLENDALE, CAL.—The city trustees have voted to sell $14,000 worth of bonds for the completion of the light system and have awarded the contract for 5,000 pounds of copper wire to J. A. Roeblings Sons Company of Los Angeles. A.

EMAUS, PA.—The Emaus Light and Power Company has been incorporated with a capital of $5,000. The directors are C. M. Walter, C. N. Wagner, A. H. S. Cantlin and R. P. Stevens, of this city, and H. W. Shantz, of Macungie.

WADESBORO, N. C.—It is reported that work will be resumed at an early date on the Blewitts Falls hydroelectric power plant at Blewitts Falls on the Pee Dee River. Work was suspended some time ago on account of litigation.

SCRANTON, PA.—The People's Electric Light, Heat and Power Company, of this city, has been granted a charter. The capital stock is $50,000 and the incorporators are P. J. Gallagher, J. G. Hufnagel, Michael O'Connor, Adolf Blau and S. N. Kramer.

ANTWERP, N. Y.—The Antwerp Light and Power Company has been organized to furnish electricity for light, heat and power, with a capital of $45,000. The incorporators are: J. A. Baumert, H. M. Baumert and P. Campbell, all of Antwerp.

MANITOWOC, WIS.—Charles Steward of Chicago has purchased the mill, mill site, dam and property on both sides of the river at Cato Falls from Stephenson brothers. It is said that the dam is to be repaired and the waterpower developed. M.

REXBURG, IDA.—It is reported that the power plant of the Idaho Power Company has been sold. The plant furnishes light and power for Idaho Falls, Rigby, Rexburg, Sugar City and St. Anthony. A Chicago corporation is said to be the purchaser.

MADISON, WIS.—The Whitehall Mill and Power Company of Whitehall has filed articles of incorporation here. The company has a capital stock of $25,000. The incorporators of the company are Thomas E. Thompson, Mathias S. Olson, John Vogsted and Evan Langberg. M.

MANTON, CAL.—The Northern California Power Company has 500 men at work on its four tunnels to convey water to the power plant at Inskip. The power plant at Inskip is nearing completion and the management expects the plant to be started in about a month. A.

TACOMA, WASH.—The contract for furnishing the city with $25,000 worth of incandescent electric lamps was awarded to the United States Incandescent Lamp Company. The bid was about two

and one half per cent lower than that offered by any other contractor.

TACOMA, WASH.—The Board of Public Works will receive bids on February 21 for the construction of the headworks and tunnel for the municipal hydroelectric power plant at La Grande on the Nisqually River. The estimated cost of the work is $657,575. A.

HARRISBURG, PA.—At a recent meeting of the Harrisburg Light, Heat and Power Company the old board of directors was re-elected. The board elected the following officers: Mr. Wallower, president; H. W. Stone, secretary, and C. H. Kinter, general manager.

SALT LAKE CITY, UTAH.—A meeting of a number of prominent electrical men was held recently at the Commercial Club for the purpose of more rigid enforcement of the inspection rules for electric wiring of all buildings and a higher standard of workmanship generally.

OAKLAND, CAL.—The People's Electric Light and Power Company has voted to issue thirty-year, five per cent bonds to the amount of $250,000. In a statement just filed, the capital stock is given as $500,000—$300,000 of which is common and $200,000 preferred stock. A.

SEATTLE, WASH.—Sealed proposals are being received by C. B. Bagley, secretary of the Board of Public Works, for the installment of a complete system of cluster lights along Broadway and North Broadway, from the north line of East Pike Street, to the south line of East Roy Street. A.

SACRAMENTO, CAL.—The Great Western Power Company has completed its power lines, laterals leading from the main system and the transformer house at Oak Park. The company is planning the erection of a number of concrete and steel sub-stations for the distribution of electric power for lighting. A.

LOS ANGELES, CAL.—The Pacific Light and Power Corporation was recently formed here as a merger of the Pacific Light and Power Company with a subsidiary companies, with a capital stock of $40,000,000, by W. G. Kedckhoff, K. Cohn, Chas. Forman, A. M. Kent, H. E. Huntington and Geo. S. Patton. A.

FRESNO, CAL.—William S. Douglass and C. M. Russell of this city have appropriated the water rights in Fish Creek four miles above its mouth for generating electricity. A diverting dam is to be built across the stream, and the water will be conveyed through a tunnel three and one-half miles to the power site. A.

NEWPORT, CAL.—The Edison Electric Company has stated that it would consider a proposition to erect a generating plant at Newport Beach, Cal., at a cost of $10,000,000, if the city would donate ten acres of land near the sea. The matter is in the hands of a committee selected by the Chamber of Commerce. A.

CROSS, GA.—The street committee of the city council has recommended the addition of fifty more lights for street-lighting during the present year. The cheaper rates for current for arc lighting announced by the Loomis syndicate, will make it possible for the city to procure lights at a more satisfactory rate than ever before. L.

ELLENSBURG, WASH.—S. P. Wippoe, of the electric light committee of the city council, announces that the municipal electric plant on the Yakima River, two miles west of the city, will be equipped with a steam auxiliary plant, and that the power canal carrying water from the river to the turbine will be enlarged. A.

TACOMA, WASH,—Before beginning work on the 10,000-foot tunnel to be driven through solid rock at the Nisqually Power Plant, a hydroelectric power plant of 500 horsepower will be installed to develop current to operate cars for transporting the rock from the tunnel and to furnish light and operate the compressors. A.

CLEVELAND, O.—The capital stock of the Cleveland Electric Illuminating Company has been increased from $6,500,000 to $10,000,000 to carry out extensive improvements. A new plant is to be built on the unit system, with a view of making further additions. The ultimate capacity of the power house will be 335,000 horsepower.

WALLACE, MONT.—The Big Bend Water Power Company of Spokane is preparing to supply the Coeur d'Alenes with power from a plant on the Spokane River. It is expected that work on this 20,000-horsepower plant will be started soon. Electric power is now being supplied to the Coeur d'Alenes by the Washington Water Power Company.

LARAMIE, WYO.—E. J. Bell and R. D. Stewart, of this city, have been granted a thirty-year franchise for supplying the city with light and power. The plant, which is to cost about $300,000, is to be located in the mountains thirty miles from the city and will develop about 4,600 horsepower. Power will be obtained from Nach's Fork and Libby Creek.

LAIDLOW, ORE.—H. H. Humphrey and Mrs. Carra Kirkham-Swafford of Kennewick, Ore., have bought the two Awbrey falls and the B. F. Nichols falls on the Deschutes River near Laidlaw for $50,000. The purchasers are said to have plenty of financial backing to develop the water power of the falls, which is estimated at between 40,000 and 50,000 horsepower. A.

RUSSELLVILLE, ALA.—This city has every promise of electric lights by April 1 and water works a little later. Men have been for some time figuring on putting in the plants. With a few minor changes asked for in the franchise which will be made in a council meeting, nothing now seems to stand in the way of success of this very much needed public utility. B.

MUSKEGON, MICH.—The proposition to establish a $75,000 municipal lighting plant which, according to City Engineer Tabor's figures, would save the city nearly $5,000 a year, is gaining much favor. The contract of the Muskegon Traction and Lighting Company expires June 1, 1911, and residents believe that the city is paying too much for the illumination of the street with arc lights.

McCLURE, PA.—The McClure Electric Light, Heat and Power Company was recently incorporated and a charter has been applied for. The company is capitalized at $5,000. The officers are: President, T. H. Spiegelmyer; vice-president, J. H. Heeter; secretary, Isaac Middleswarth; superintendent, H. W. Knepp. The new company has purchased the electric plant formerly owned by H. W. Knepp.

CRAB ORCHARD, NEB.—A franchise has been granted to C. L. Rothell and others to install and operate an electric lighting plant in this place. The city has never had electric lights. A stipulation of the franchise is that the plant must be up-to-date and entirely adequate to take care of the business of the place. Mr. Rothell is endeavoring to organize a stock company at Sterling to take up the matter.

SAN FRANCISCO, CAL.—The Russian River Light and Power Company has been incorporated here with an authorized capital stock of $300,000, by J. E. Bennett, of San Mateo, H. C. Eastman, of Los Gatos, N. M. Twomey, of San Francisco, E. H. Hough, of Kentfield, and L. R. Dickey, of Alameda. The company proposes to erect power stations for the manufacture of electricity, for power and other purposes. A.

LOS ANGELES, CAL.—The Redondo plant of the Pacific Light and Power Company is to be doubled in capacity at an expenditure of about $3,000,000, half of which will be spent on the plant itself and half on the distributing system. The Pacific Light and Power Corporation which is to carry out the work has been incorporated to succeed the Pacific Light and Power Company. The new companoy is capitalized at $4,000,000.

MASON CITY, ILL.—Franchises have been granted to E. A. Abbot, Richard Abbot, and Ira Abbot, allowing them to use the city streets for their high-tension transmission lines. The generating plant will be located at Petersburg and lines will be run through Greenville and Curtis to this city, thence east to New Holland, west to Easton and Teheren and north to Natrona and San Jose. The lines will extend over a distance of about thirty-eight miles.

SACRAMENTO, CAL.—The East Sacramento Water Company has been incorporated for $205,000 by H. J. Gothe, G. P. Beere, N. A. McClelland, H. Taubner Gothe, Thomas Oates, Peter Zingg and Albert Elkus. It is the purpose of the company to supply water, gas and electricity for east Sacramento. The directors of the company will soon hold a meeting to take steps to apply for franchises and to decide on the size and kind of buildings to be erected at the plant. A.

ANNISTON, ALA.—The General Electric Company is reported to be behind a project for the purpose of generating electricity from water power and transmitting it between Anniston and Talladega, Ala., and all intermediate points. The Alamaba Power and Development Company is the name of the corporation which has been formed for the purpose of carrying out these plans. The system of the company has already been surveyed and rights of way are being secured.

NOME, ALASKA.—Stuart Weatherly and Fox Ramsey, the incorporators of the Seward Peninsula Power Company, have purchased the Nome Electric and Power plant, formerly owned by the John J. Sesnon Company, and placed Arthur Gibson in charge. A new plant will be built on the sand spur west of the Snake River. The power will be transmitted many miles to the creek and beach mines, where it will be used for hoisting purposes and dredging. One pole line will run to Solomon, forty miles distant. A.

BOULDER, COL.—The Boston-Colorado Power Company, just incorporated, is capitalized for $2,000,000 and the construction of the power plant will probably commence about April 1. The power will be developed from the waters of Left Hand and Jim Creeks, and a large storage reservoir is to be built a short distance below where these streams unite. Much of the power developed will be used to operate mines owned by men connected with the project, and the surplus will be disposed of to mine operators of that district. The incorporators are John Wilbur Kay, Frank D. Patterson and Thomas H. Gibson, all of Denver.

BEDFORD CITY, VA.—Negotiations for the purchase of the Snowdon dam on the James river from the Amherst Pulp Manufacturing Company, have been completed by W. R. Abbott, Jr., for the town of Bedford City, the price paid being $32,500. The town will dispose of $100,000 recently voted bonds, and as soon as practicable work will be started on a hydroelectric development at the dam, and the building of an electric power plant. It is stated that

a minimum of 1,000 horsepower is available. The deal includes a large area of timber lands. L.

JEFFERSONVILLE, IND.—The Jeffersonville Water, Light and Power Company has filed articles of incorporation with the Secretary of State. The capital stock is $150,000. The object of the company is to supply the city of Jeffersonville and vicinity with water for domestic, manufacturing and fire extinguishing purposes; to build, equip and operate plants for furnishing the city with electric light, gas light, heat and power for domestic use and manufacturing purposes. James P. Goodrich and Jesse T. Moorman, Winchester, Ind., Augustus C. Huey, and Henry C. Starr, Richmond, Ind., and John A. S. Graves of Chicago, Illinois, are the incorporators. S.

WATERVILLE, ME.—A plan for consolidation of companies, which is expected ultimately to include all the power interests in Maine, was formed a short time ago at a meeting of the Messalonskee Electric Company. This company, which will now be called the Central Maine Water Power Company, will purchase the following companies: Fort Halifax Power Company, Winslow; Sebasticook Water Power Company, Benton; Sebasticook Power Company, Pittsfield, and certain stock and holidngs of the Kennebec Light and Heat Company of Augusta.

The board of directors was increased to thirteen and the following elected: H. D. Eaton, W. S. Wyman, J. N. Webber, Winthrop Coffin, J. R. Macomber, G. F. West, S. C. Manley, Josiah S. Maxim, Guy P. Gannett, Charles E. Vickery, W. M. Ayer, J. H. Kelleher and George A. Hegarty.

RICHMOND, VA.—The Virginia Railway and Power Company has contracted with the American Locomotive Works to furnish the latter with 1,000 horsepower for five years, at the Richmond branch of the company. This fact is taken as substantiation of the claim of the Virginia people that they are in a position to supply power to manufacturng and other industries much cheaper than these industries can manufacture their own power by privately owned generating plants. The Locomotive Works directors have, it is said, planned to make a more general use of the electric current than ever before, in their large plants, finding electrically driven machinery, and the electric current far more satisfactory than other power, including steam. It is further added that the Locomotive Works have agreed that they will not consider the installation of further generating plants or machinery in their works, so long as the Virginia Company supplies them with electric power on the basis of the newly drawn contract. L.

ELECTRIC RAILWAYS.

(Special Correspondence.)

FULLERTON, CAL.—The Pacific Electric Railway Company is rushing the extension of the electric line from La Mabra to Olindo and Yorba. A.

YANKTON, S. D.—C. A. Magee, Pittsburg, Pa., states that he will commence work in March on the construction of an electric line to Centerville, Freeman and Parkston. C.

LODI, CAL.—The Central Traction Company is rushing work on the road between Lodi and Sacramento. A part of the road is expected to be in operation within sixty days. A.

DINUBA, CAL.—The Visalia Electric Railroad Company will build their road from Maranjo and Woodlake to Orosi and Dinuba as soon as the right of way can be secured.

SOUTH BEND, IND.—The officials of the Lake Shore Electric Railway Company report an increase in gross earnings for December of $8,776 and for the year 1909 of $68,789. S.

EVANSVILLE, IND.—The Evansville and Olney electric railroad will be built by the Burns Construction Company of Chicago and it is probable that work will start not later than June 1.

EUREKA, CAL.—The business men of Eureka and Redding are planning the construction of an electric railway between the two cities. The estimated cost of the proposed line is $7,000,000. A.

ALAMEDA, CAL.—The Southern Pacific Railroad Company has been granted a franchise to construct and operate an electric line from the lower part of the county through Alameda to the Alameda mole. A.

WICHITA, KAN.—H. E. Chubbuck, general manager of the Illinois Traction System has opened negotiations for the construction of a $700,000 power plant here. The McKinley syndicate controls the Wichita property.

MODESTO, CAL.—John Mehling, of the Tidewater and Southern Railroad Company, says that the company has practically completed arrangements for the building and financing of an electric railway which is to connect Modesto and Stockton. A.

ROCKFORD, ILL.—Work on the improvement of the Rockford Interurban electric railway will start as soon as the weather permits. It is said that $250,000 will be spent in Rockford during the coming summer, in adding to and improving the present system.

STERLING, ILL.—The Northwestern Engineering and Construction Company, which has the contract for the construction of the line of the Rock River Traction Company, has commenced active work. The line will extend from this city to Prophetstown, Ill. C.

MILWAUKEE, WIS.—The Milwaukee and Fox River Valley Railway Company is securing the right of way for the construction of a line 135 miles long and estimated to cost $3,000,000, to Appleton, Wis., by way of Cedarburg, Plymouth, Elkhart Lake, Kiel and Chilton. C.

GRIFFIN, GA.—The city council has received application for street railway franchise and referred the matter to a special committee for investigation and report. Promoters of proposed road include H. H. Bass, J. D. Boyd, B. R. Blakely, Frank Flynt of Griffin and others.

VANCOUVER, B. C.—The British Columbia Electric Railway Company has awarded the contract for building its new power plant at Vancouver, B. C., to Charles C. Moore & Company, engineers, of San Francisco, Cal. The plant will have a total capacity of 4,000 kilowatts. A.

BRYAN, OHIO.—A franchise has been granted to the Ft. Wayne & Toledo Electric Railroad Company, to lay tracks and operate cars in this city. Work must be started within one year and completed within two years. The line will connect with the present tracks of the Toledo & Indiana. H.

KOKOMO, IND.—The Kokomo, Marion & Western Traction Company reports a net increase of earnings for December of 57.4 per cent. over the corresponding month for 1908. The gross income was increased 29.1 per cent. The gross income for the year was $233,862.77, as against $199,174.91 for 1908. S.

TOLEDO, OHIO.—Announcement has been made by Charles F. Smith of Toledo, general manager of the Toledo, Bowling Green & Southern Traction Company, that arrangements are now being made with eastern parties to finance the southern extension which will be constructed as soon as affairs can be settled. H.

EUREKA, CAL.—Estimates made on the cost of constructing a proposed electric railroad between Eureka and Redding or Red Bluff, place its cost at $7,000,000. According to E. E. Skinner of the committee of ten Eureka business men now investigating the proposition, the building of the line is perfectly feasible.

JANESVILLE, WIS.—The Rockford Interurban Company has asked the city council for permission to operate its cars on South Main street, going up to Milwaukee street, and forming a loop. The interurban line will enter the city on the tracks of the local system, which is to be practically rebuilt by its new owners. M.

MONTICELLO, IND.—February 14 is the day set by the commissioners of White County to hold a subsidy election in Princeton, Honey Creek and Union townships in aid of the construction of the Northwestern Traction line. The sum of $15,000 is asked from each township. The people generally are in favor of the proposed road. S.

MILVILLE, N. J.—At a meeting of the business men of Millville and Commercial townships Thursday night it was decided to sell bonds to raise the $10,000 necessary to build a trolley line from Port Norris to Millville. The Commercial Township Committee granted the right of way for the proposed line and the meeting was enthusiastic.

NEWCASTLE, IND.—The first car propelled by electric power was run over the Indianapolis, Newcastle & Toledo traction line January 26. The trip was pronounced successful and enjoyable by the guests who made the trip on the invitation of chief engineer White. A regular schedule is being prepared for the opening of the road for traffic. S.

BERKELEY, CAL.—The East Shore and Suburban Railway Company has filed an application with the trustees of Albany asking for a franchise for an electric street car line. The franchise, if granted, will link Richmond, Stege, San Pablo, Rust and Point Richmond with the Southern Pacific Railroad system, connecting with San Francisco. A.

GILEAD, IND.—The Winona Interurban Company drove the golden spike that connected Warsaw and Peru at this place January 20. The event was celebrated by dismissing the schools, ringing of church bells and speeches of congratulations. C. O. Johnson, general manager, said the ballasting would be rushed and the line opened for traffic in a short time. S.

LOS ANGELES, CAL.—The Pasadena Rapid Transit Company which was incorporated for the purpose of constructing an elevated railway from Los Angeles to Pasadena has secured the right of way on over six miles of the proposed road, two miles of which are in the city of Los Angeles proper. The company, however, will not purchase any land until all of the stock has been sold. A.

COVINGTON, IND.—J. J. Burns of Chicago has been elected president of the Covington and Southwestern Traction Company. Mr. Burns was also added to the directorate. The directors have decided to rush the work of completing the road as rapidly as possible and reported that they have placed an order with the Illinois steel Company for $2,500 tons of steel rails to be delivered in February. S.

EVANSVILLE, IND.—At the annual meeting of the stockholders of the Evansville & Southern Indiana Trction Company, P. K. Williams of Hartford City and Fred Vanarinan of Evansville, were added to the board of directors, and the following officers elected: Charles Murdock, of Lafayette, president and treasurer; Alvin L. Ketselman, of Muncie, vice-president and William V. Stuart, of Anderson, secretary. S.

LAWRENCE, MASS.—Officials of the Boston & Northern Street Railway Company have ordered repairs and a reconstruction of the present power plant on Merrimack street, which will mean practically a new one. Work has been started. Among the improvements, two boilers of high pressure will be installed. A 150-foot chimney with a nineteen-foot base will also be erected. One of the main features will be the installation of a 1200-kilowatt dynamo.

LOGAN, UTAH.—Articles of incorporation have been filed with the secretary of state by the Logan Rapid Transit Company, which has a capital stock of $100,000. The officers of the new company are: President, David Eccles; vice president, Robert Anderson; secretary and treasurer, Joseph Quinney, Jr. The directors are David Eccles, Robert Anderson, Joseph Quinney, Jr., B. F. Ritter, H. E. Hatch, D. C. Budge, Joseph Howell, E. P. Bacon, John A. Widtsoe and George Thomas. N.

FT. WAYNE, IND.—A united effort is being made by the commercial bodies to have the Ft. Wayne and Wabash Valley Traction Company select this city as a location for the $500,000 car shops, which the company is preparing to build in some city along its line. The traction company officials are displeased with the city of Ft. Wayne for having entered into competition with the traction company for commercial lighting and announced that no more investments would be made in that city. S.

SALT LAKE CITY, UTAH.—The Salt Lake & Ogden Railway Company, commonly known as the Bamberger railroad, has placed an order with the Jewett Car Company, for a number of interurban electric cars to run between Salt Lake City, and Ogden. The line work is complete and the work is being rushed on the steam power plant at Lagon, midway between Salt Lake City and Ogden. Four sub-stations are also being built, two south of Lagon at Centerville and Stocton and two north of Lagon at Clearfield and Ogden. N.

GUTHRIE, OKLA.—The Oklahoma City and Fort Smith Traction Company has been chartered to build an electric railway from Oklahoma City to Fort Smith, Arkansas. The estimated length of the line is 200 miles and estimated cost $4,000,000. It is to pass through the counties of Oklahoma, Pottawatomie, Seminole, Okmulgee, Ofuskee, McIntosh, Muskogee, Haskell, Leflore to Fort Smith. The directors are V. S. Bath, P. M. Mowry, G. L. Wood, F. M. Wood, A. M. Gustin and John Wils, all of Oklahoma City. The company has a capital of $100,000.

LEXINGTON, N. C.—The town of Lexington has granted a franchise to S. E. Williams and J. E. Foy, of Lexington, to build an electric line through the town. It is said that this is part of the general plan heretofore mentioned, to build an interurban line connecting Lexington with Salisburg on the south and Greensboro on the north, a total distance of forty-five miles. The promoters will also ask for the necessary franchines through Davidson County in which a major section of the proposed route lies, and through Guilford and Rowan and Randolph counties. L.

INDIANAPOLIS, IND.—According to the report of B. B. Peck, vice-president of the Indianapolis Traction & Terminal Company, 14,211 passenger trains entered the terminal station during January, 1910. The average was 459 trains per day. The statement is an increase of 700 trains over January, 1909. In addition there were 1,703 freight trains entered the freight station adjoining during January. All of the traction lines entering Indianapolis increased the number of trains on their lines during the past six months in order to take care of the business. S.

GRAND JUNCTION, COL.—Construction work has been commenced on the Grand Junction-Fruita Interurban electric line, and officials of the company announce that the line will be completed by June 1. The Grand Junction & Grand River Valley Railway Company, which is putting in this road, has been granted a franchise in Fruita for the electric lighting of that town. An interurban road is practically assured between Grand Junction and Palisade, and the ranchers between the two towns say they will also apply to the company for electricity for domestic use.

INDIANAPOLIS, IND.—A. B. Conover of Chicago, Guy M. Walker of New York, T. N. Lucas of Frankfort, Ind., A. E. Reynolds of Crawfordsville and Hugh Daugherty of Indianapolis, representing the bond holders have filed a foreclosure suit in the Federal court against the Indianapolis, Crawfordsville & Western Traction Company, known as the "Ben Hur" line . Arrangements have been made by them to buy the road and reorganize the company and place it on a paying basis by extending the line from Crawfordsville to Veedersburg and ultimately as far as Danville, Illinois. S.

ANNAPOLIS, MD.—A new electric railway to run from Reisterstown, Baltimore county, to Hanover, Pa., is projected, according to a bill introduced in the Senate by Senator Biddison. The measure incorporates the Baltimore & Pennsylvania Railway Company, with James H. Wilson, Jacob H. Sherman, Jacob A. Frederick, Newton S. Watts, Jacob Pierce Bruns, Frank L. Hancock, Daniel F. Reisenwehr and William T. Deitrich named as the incorporators. The capital stock is placed at $600,000, with the privilege of increasing it to any amount that may be deemed necessary. According to the bill the road is to run from Reisterstown "around or through Hampstead and Manchester, Carroll county, to the Pennsylvania State line." Permission is given the incorporators to acquire the Hampstead & Manchester Railroad franchise.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

ATKINSON, NEB.—The Atkinson & Saratoga Telephone Company has been incorporated with a capital stock of $3,000. P.

ATKINSON, NEB.—The Grand Prairie & Emmett Telephone Company has been incorporated with a capital stock of $25,000. P.

SAN FRANCISCO, CAL.—The Home Telephone Company has opened the long distance service between San Francisco and Oakland, Cal.

ANNVILLE, PA.—The Cleona, Bismark and Fontana Rural Telephone Company has recently been chartered. The company is capitalized at $5,000.

LINTON, IND.—Fire has destroyed the Linton Telephone plant. The officials will be in the market for new equipment as soon as the new exchange is completed. S.

WILMINGTON, DEL.—The Ecuador Long Distance Telephone Company has been incorporated with a capital of $1,000,000 by F. M. Shive, S. E. Roberson, H. W. Davis, Wilmington.

VAN DYNE, WIS.—The Van Dyne Telephone Company has been incorporated with a capital of $5,100. The incorporators are: H. J. Haulbrick, E. G. Stillemacher, William Tunk and John Kind.

MADISON, WIS.—The South Greenville Farmers' Telephone Company, Greenville, has been granted a charter. The capital stock is $7,200. The incorporators are Louis Pingle, J. H. Schneider, and Albert Mass. M.

CLINTON, N. C.—The Garland Telephone Company has changed its name to the Consolidated Telephone Company, and increased the capital stock from $5,000 to $25,000. Headquarters are in this city. L.

SULLIVAN, IND.—The Business Men's Telephone Company has been organized to build and equip a local telephone system in this city. The organization of the company is the result of an increase in rate by the Sullivan Telephone Company. S.

PLYMOUTH, WIS.—The Plymouth Telephone Company has voted to increase its capital stock from $1,100 to $6,000, and to enlarge the purpose of its charter so as to permit the company to do business in Sheboygan county, instead of Plymouth exclusively, as heretofore. M.

BARABOO, WIS.—The Wisconsin Telephone Company has purchased the entire system of the Baraboo Telephone Company, including the North Freedom exchange. The Baraboo Telephone Company has been operating its lines in Baraboo for about fifteen years. M.

PORTERVILLE, CAL.—The old telephone line purchased several months ago from the Sunset company by J. C. Danner of White River, and which is being replaced with a metallic circuit phone line, has been sold to farmers headed by A. J. Saladay and M. S, Bachman, of the Bear Creek and Poplar districts. A.

WAYNE, MICH.—The following officers were this week chosen by the People's Telephone Company, of this city, for the ensuing year: President, Joseph Waltz; vice-president, E. C. Maxwell; secretary, Frank E. Gee; treasurer, Frank L. Edwards. The company now has about 100 miles of pole lines and 500 phones in operation, and the service will be greatly expanded during the coming year. H.

HARTFORD, CONN.—The Southern New England Telephone (Bell) Company and the Farmington Valley Telephone Company, an independent concern, have negotiated a traffic agreement. As a result of the arrangement the toll line connections of the Southern New England company are available for the subscribers of the Farmington Valley company. The Farmington concern operates through a chain of towns in the Farmington Valley.

LUMBERTON, N. C.—The Southern Bell Telephone Company which recently came into possession of the local telephone exchange, will proceed with the making of such repairs and improvements as are necessary to make the system thoroughly up-to-date. Long distance service will be procured by building a metallic line circuit to Maxton, where a long distance connection will be made, giving the local patrons full access to the entire Southern Bell long distance toll lines. L.

ATLANTA, GA.—The Southern Wireless Telephone and Telegraph Company has made formal application for a charter in Atlanta, the applicants being H. J. Pursley, Jr., Geo. W. Derrick, and Walter C. Bennett, the authorized capital to be $1,000,000. The promoters declare that they will establish a wireless telephone system through the south with headquarters here, and will handle accessories for power boats, yachts and machinery in connection with their other business. L.

OAKLAND, CAL.—The Home Telephone Company intends to spend $500,000 in the extension of its system to Alameda, according to T. C. Craig, the local manager. A separate exchange centrally located in Alameda, a system of underground wires contained in damp-proof cables, and one-party lines connecting direct with the switchboard will be the chief features of the new extention. The main cables connecting with the Oakland office will be run under the estuary near the Webster Street bridge, but will be sufficient in number to allow connections to be made with Oakland, Berkeley or San Francisco without loss of time. A.

LEGAL NOTES.

A RAILROAD COMPANY CANNOT LAY TRACKS WITHOUT CONSENT OF CITY.—An important decision has been rendered by the Indiana Supreme Court which applies alike to steam and electric traction lines. The Grand Trunk railroad attempted to place double tracks on Division Street in South Bend, and the city authorities stopped the work, whereupon the railroad asked for an injunction to restrain the city from interfering with its plans. The case finally reached the Supreme Court, where it was held that neither the state nor the city can bargain away or surrender the police power to guard the lives, health and safety of citizens. Where the right was granted to the railroad by city ordinance to lay double track on a certain street in 1868, and a single track was built therein and operated for thirty years, without any attempt to lay a double track, the City Council had power then to repeal the privilege of laying another track in the street. S.

RIGHT TO USE SUITABLE APPLIANCES AND REELS ON STREETS.—Authority given by a municipality to a telephone company to erect and maintain telephone poles and wires on its streets, the supreme judicial court of Maine holds, in the case of Simonds vs. Maine Telephone and Telegraph Company, carries with it the right to use at needful places on the streets suitable appliances for such erection and maintenance. Such appliances at such places on the streets, though they are likely to frighten well-broken horses carefully driven, are not nuisances in and of themselves. For example, a reel three feet long and four feet in diameter, with lead pipe coiled upon it, and placed next the sidewalk in the line of telephone poles, for the present purpose of stringing the pipe on the poles to inclose telephone wires, and leaving ample room for the travel along the street, not being shown to be an unsuitable appliance or in a needless place, was not a nuisance, though so placed it was likely to frighten well-broken horses carefully driven.

HIGHEST DEGREE OF CARE REQUIRED.—The highly dangerous and subtle nature of electricity is said by the Kansas City Court of Appeals, in the case of Day vs. Consolidated Light, Power and Ice Company, to have compelled the courts of Missouri to require of persons who make merchandise of electricity, and who transmit it along the public thoroughfares of populous communities, the exercise of the highest degree of care to prevent its escape from appointed channels. Where it reasonably may be said that an ordinarily careful and prudent person observing the highest degree of care would anticipate that persons in the exercise of lawful right might be brought into contact with wires carrying powerful currents of electricity, the law charges the owner of such wires to insulate them and to maintain them in a proper state of repair. And the court holds that if the defendant company had reason to anticipate, while employing the highest degree of care, that persons rightfully on the roof of a building might come into contact with a defectively insulated wire, it became its duty to exercise the highest degree of care to repair or replace the defective wire, and a breach of such duty would constitute negligence.

ELECTRICAL SECURITIES.

The contraction in market values of stocks last week and the heavy liquidation which caused it is somewhat difficult to explain. The excess of the preceding speculation, which had pushed prices to unwarranted heights during the year 1909, was, however, assumed to be responsible for the violence of the reaction.

Many orders for iron and for railway equipment have been cancelled and this has had the effect of making a marked reduction in prices. The raising of capital for extension has also presented many difficulties.

The relation of corporations to the law is a continuing topic. The public agitation on the subject of high cost of living also had an unfavorable effect on the market. A less abstruse but effective influence on stocks is the pushing of the movement by the banks to clear out of their collateral for loans such stocks as are under the suspicion of manipulation by pools.

The annual meeting of the Mackay Companies will be held in Boston, February 15.

Howard Murray has been elected a director of the Shawinigan Water and Power Company, of Montreal, taking the place of J. N. Greenshields, resigned.

The Northwestern Elevated's (Chicago) daily average traffic for January was 117,860, an increase of 6,059, or 5.42 per cent, over the previous year. The Metropolitan Elevated's (Chicago) January traffic was 159,000 passengers, or an increase of 23,000. That of the Oak Park Elevated gained ten per cent, or nearly double the percentage of gain reported by the Northwestern Elevated.

The Massachusetts Electric Companies are maintaining the record of earnings. For the first twenty-five days of January the increase in earnings in the face of bad weather conditions was $34,000.

The New York Public Service Commission, Second District, has authorized the Oswego River Power Transmission Company to execute a mortgage securing $100,000 five per cent twenty-year bonds and to issue $60,000 of bonds to be sold at not less than eighty-five.

Nothing was said about dividends at the annual meeting of the stockholders of the Detroit United Railway, and it is not likely that dividends will be declared for at least another year. The annual report showed gross earnings of $8,047,554; operating expenses, $5,042,724; net earnings, $3,004,830; income from other sources, $144,833. Total net income $3,149,663.

Chicago Railway Company's official estimate that the city of Chicago's fifty-five per cent share of earnings for January will amount to $51,000 and for December to $59,400. This makes the city's share for the entire fiscal year $801,555 against $864,290 in the previous year. The city's share in the past three years has amounted to $2,554,761 the largest compensation received from any public utility. Chicago City Railway books will be closed from March 5 to 15 inclusive for the annual meeting on March 16.

Southern New England Telephone Company directors have decided to issue $1,099,100 additional stock to be offered to stockholders in ratio of one new share for seven shares of present stock. The stock will not be issued until October and will be payable in two installments, the first of which will come due in January, 1911. At the annual meeting of stockholders of the Southern New England Telephone Company the retiring directors were re-elected. The directors organized by electing the retiring officers.

Gross earnings of Brooklyn Rapid Transit for January did considerably better than in December. The daily gain averaged close to $4,000, making the actual increase in gross for the month about $120,000, or slightly better than seven per cent. For the last two months Brooklyn Rapid Transit has not been able to save as large a portion of the gross gain for net as was the case up to December. This is entirely the result of the two heavy snow storms, which cost the company in aggregate over $125,000. The company is sharing its prosperity with its men, as was evidenced when the January increase in wages of five per cent was made. This item alone will cost the company nearly $200,000 per year.

DIVIDENDS.

Brooklyn Rapid Transit Company; the usual quarterly dividend of one per cent, payable April 1.

Chicago City Railway Company; an extra dividend of four per cent, payable March 2 to stock of record February 21. Books close February 22 and reopen February 27. The regular quarterly dividend of one and one-half per cent, payable in the latter part of March, will make ten per cent for the year, whereas a year ago three per cent extra was declared, making nine per cent for that year.

Mobile Electric Company; a quarterly dividend of one and one-half per cent upon the preferred stock, payable February 15.

National Carbon Company; quarterly preferred dividend of one and three-quarters per cent, payable February 15.

NEW YORK.

	Feb. 7.	Jan. 31.
Allis-Chalmers common	11½	12½
Allis-Chalmers preferred	38½	42
Amalgamated Copper	77⅝	82
American Tel. & Cable	80*	80*
American Tel. & Tel.	136¼	137
Brooklyn Rapid Transit	71¼	72⅞
General Electric	50⅞	52½
Interborough-Metropolitan common	18⅞	21⅝
Interborough-Metropolitan preferred	49½	56
Kings County Electric	129	129
Mackay Companies (Postal Telegraph and Cables) common	88	88¾
Mackay Companies (Postal Telegraph and Cables) preferred	75	77½
Manhattan Elevated	134	136
Metropolitan Street Railway	18	20
New York & New Jersey Telephone	123	123½
U. S. Steel common	80	84
U. S. Steel preferred	120¼	123½
Western Union	71	71
Westinghouse common	67	71
Westinghouse preferred	125	125

*Last price quoted.

BOSTON.

	Feb. 7.	Jan. 31.
American Tel. & Tel.	136¼	137
Edison Elec. Illuminating	244	242
General Electric	150⅞	155
Massachusetts Electric common	16⅝	19
Massachusetts Electric preferred	81	81
New England Telephone	125½	134
Western Tel. & Tel. common	15	15
Western Tel. & Tel. preferred	90	89

PHILADELPHIA.

	Feb. 7.	Jan. 31.
American Railways	46¾	47⅝
Electric Company of America	11⅞	12
Electric Storage Battery common	58¼	58½
Electric Storage Battery preferred	58¼	58½
Philadelphia Electric	14⅛	14
Philadelphia Rapid Transit	26	26¼
Philadelphia Traction	88¼	88½
Union Traction	50½	51

CHICAGO.

	Feb. 7.	Jan. 31.
Chicago Railways, Series 1	105	107
Chicago Railways, Series 2	29	29½
Chicago Subway	3	3½
Chicago Telephone	127	127½
Commonwealth Edison	115½	115½
Metropolitan Elevated common	15	15½
Metropolitan Elevated preferred	52½	54
National Carbon common	107	107
National Carbon preferred	116	118

PERSONAL MENTION.

C. E. ENGLISS of Atlantic City, N. J., was recently elected president of the New Jersey Electrical Contractors' Association.

BERNARD GALLAGHER has recently been elected a director of the Brooklyn Rapid Transit Company to take the place of the late C. H. Harriman.

FRED A. BIGELOW, formerly New England representative of the Carpenter Steel Company, of Reading, Pa., has been appointed manager of its Cleveland branch.

EDWIN W. WINTER, president of the Brooklyn Rapid Transit Company, sailed last week for a three months' sojourn in Egypt and the Mediterranean countries.

A. A. GARRIS has resigned as superintendent of the municipal light and water plant at Grand Rapids, Mich., and will engage in electrical wiring and general repair work.

WALTER M. McFARLAND, acting vice-president of the Westinghouse Electric and Manufacturing Company, East Pittsburg, Pa., has resigned on account of other business interests.

GEORGE J. MARROTT, formerly owner of the city car lines of Logansport, Ind., is at the head of the project to build the Kokomo, Frankfort and Terre Haute trolley line from Kokomo to Terre Haute.

W. E. KIRKPATRICK, vice president of the Metropolitan Street Railway Company, of Kansas City, Mo., has been made acting president of the company until a successor to Bernard Corrigan, who recently resigned, can be chosen.

C. D. BOYD has been appointed Michigan representative of the Kellogg Switchboard and Supply Company with headquarters at Grand Rapids, Mich. Mr. Boyd has a wide acquaintance among the telephone interests of the Central States.

BERNARD E. SUNNY, and C. G. DUBOIS, the former, president of the Chicago Telephone Company, and the latter, comptroller of the American Telephone and Telegraph Company, have been elected directors of the Western Electric Company, to succeed Messrs. Crane and Sherwin. The other officers of the company were re-elected.

ALBERT SPIES, well known as the editor of the *Electrical Record*, has retired from the editorship of that publication after its February issue, to become the managing director of *Foundry News*, a new illustrated monthly publication devoted to the foundry arts. His office will be in the Hudson Terminal Building, 50 Church Street, New York city. *Foundry News* will make its first appearance in April.

JOHN F. COLLINS, who has been general manager of the Saginaw Valley Traction Company of Saginaw, Mich., was recently elected assistant general manager of the Toledo Railway and Light Company, and president of the interurban lines controlled by that company. Among these lines are Toledo & Western, Toledo & Maumee Valley and the Ottawa Beach railways. Mr. Collins will assume his new duties about April 1.

HOWARD G. HETZLER, formerly president of the Metropolitan Elevated Railroad, Chicago, Ill., was elected president of the Western Indiana Railroad, a terminal road operating around Chicago, to succeed E. B. Pryor. Mr. Hetzler will have charge of the improvements soon to be made by the Western Indiana. His selection was due largely to the fact that he has had long experience as superintendent of the terminals in Chicago for the Chicago, Burlington & Quincy Railroad.

OBITUARY.

E. P. BRYAN, president of the Interborough Rapid Transit Company of New York, recently died of apoplexy at San Juan, Porto Rico, where he was spending the winter.

LAFAYETTE WETMORE, of Louisville, N. Y., died recently, after several months' illness. Mr. Wetmore was interested in several hydroelectric generating plants and carried out a plan of supplying power from Beaver River more than ten years ago.

B. R. McALPINE, a former president of the Western Union Telegraph Company, died last week in his apartment at the Dakota, New York city, aged ninety-one years. Mr. McAlpine was born in Rochester and was admitted to the bar at the age of twenty-one. Later he became a member of the legal staff of the telegraph company, and finally its president. He drew up the contract which to this day appears upon the back of the blanks used for messages. He retired from business about thirty-five years ago.

JOHN C. REILLY, a widely-known telephone pioneer, died from pneumonia and heart failure at midnight Friday, February 4, at his home 226 Garfield Place, Brooklyn, N. Y. Mr. Reilly was born in Lancaster, Pa., in 1856. Equipped with a common school education he began the study of telegraphy in Philadelphia. This he soon abandoned for the telephone business, and in 1882 became assistant superintendent of the New York and New Jersey Telephone Company. His ability won him the office of superintendent, and he was afterward successively assistant general manager, general manager and second vice-president of the company. Mr. Reilly did most of the creative work in the building up and extending of the telephone system on Long Island, and in the company's large territory in New Jersey. He leaves a wife and four children.

PROPOSALS.

POST OFFICE, LEAD, S. D.—Notice has been given by the Supervising Architect, Washington, D. C., that the time for opening bids for the construction complete of the United States Post Office building at Lead, South Dakota, has been extended from February 4, 1910, to March 4, 1910.

POWER PLANT FOR LINCOLN, NEB.—Sealed bids will be received by the city clerk until February 24, for the construction and equipment of a lighting plant. The equipment to be made up of one 750-horsepower cross-compound condensing or non-condensing engine, or one turbine engine of the same capacity to be direct connected to a three-phase sixty-cycle alternating current generator. A belt or shaft-driven exciter must also be furnished.

POST OFFICE, ROME, GA.—The office of Supervising Architect, Washington, D. C., will receive sealed bids until March 18, for the extension, remodeling, etc. (including plumbing, gas piping, heating apparatus, electric conduits and wiring), of the United States Post Office at Rome, Ga., in accordance with the drawings and specification, copies of which may be had from the custodian at Rome, Ga., or at the Supervising Architect's Office.

POST OFFICE, DANVILLE, VA.—The office of the Supervising Architect, Washington, D. C., will receive bids until March 16, for the extension, remodeling, etc., (including plumbing, gas piping, heating apparatus, electric conduits and wiring), of the United States Post Office and Court House at Danville, Virginia, in accordance with the drawings and specification, copies of which may be had from the custodian at Danville, Va., or at the Supervising Architect's office.

POST OFFICE, FRANKFORT, KY.—The office of Supervising Architect, Washington, D. C., will receive bids until March 14 for the extension, remodeling, etc., (including plumbing, gas piping, heating apparatus, electric conduits and wiring and standard clock system), of the United States Post Office and Court House at Frankfort, Ky., in accordance with the drawings and specification, copies of which may be had from the custodian at Frankfort, Ky., or at the Supervising Architect's office.

POST OFFICE, JACKSON, TENN.—The office of Supervising Architect, Washington, D. C., will receive sealed bids until March 11, for the extension, remodeling, etc. (including plumbing, gas piping, heating apparatus, electric conduits and wiring, and standard clock system), of the United States Post Office and Court House at Jackson, Tenn., in accordance with the drawings and specification, copies of which may be had from the custodian, at Jackson, Tenn., or from the Supervising Architect's office.

NAVY DEPARTMENT SUPPLIES.—The Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will open bids on naval supplies on the dates given below. Bidders interested therein should make early application for copies of the schedule, giving the schedule numbers desired. Schedules can be obtained from the Navy Pay Office nearest each navy yard. Bids will be asked on the following supplies:

Date of Opening.	Material.	Quantity.	Delivery at Navy Yard.	Schedule No.
Feb. 15	Fitting, interior, etc	Miscellaneous	Brooklyn, N. Y	2179
	Fuses, glass tube	20,000	" "	2205
	Lights, electric	Miscellaneous	Norfolk, Va	2205
	Micanite, plate	50 sheets	Various	2205
	Motor, switchboard, wire	Miseellaneous	Brooklyn, N. Y	2205
	Supplies, electrical	"	" "	2205
	Tape, insulating, cotton	550 pounds	Norfolk, Va	2205
	Tape, insulating, rubber	260 pounds	" "	2205
	Wire, magnet	250 pounds	Boston, Mass	2205
	"	400 pounds	Brooklyn, N. Y	2205
Feb. 21	Carbons, arc	5,000	Norfolk, Va	2205
	Generating set	1	Puget Sound, Wash	2188
	Telegraphs, engine	6	Las Animas, Cal	2190
Feb. 21	Armatures, fan	100	Brooklyn, N. Y	2226
	Controllers, truck light	6	" "	2226
	Hangers, insulator	2,000	" "	2226
	Sets, ventilating, portable	20 sets	" "	2226
	Transformers, oil cooled	12	Washington, D. C	2238
	Wire, silicon bronze	30,000 feet	Brooklyn, N. Y	2226
Mar. 1	Electrical equipment for U. S. S. Wyoming and U. S. S. Arkansas.	Miscellaneous	Philadelphia, Pa.	2218

NEW PUBLICATIONS.

IRRIGATION INVESTMENTS, by Ira. W. McConnell, is the title of a pamphlet recently issued by the J. G. White and Company, engineers and contractors, of New York city. Mr. McConnell is the chief irrigation engineer of this company, and his little work forms an acceptable contribution to the timely and important subject of irrigation engineering.

ELECTRIC HEATING AND COOKING.—Under this title the Carnegie Library of Pittsburgh, Pa., reprints from the Monthly Bulletin, January, 1910, a list of articles on electric heating and cooking to be found in the various technical books and periodicals in the library. This unique catalogue includes articles up to December 1, 1909, and will be found of considerable assistance to experts and others interested in the subjects listed, inasmuch as it covers a wide field of available technical literature.

INDUSTRIAL ENGINEERING AND THE ENGINEERING DIGEST.—This monthly publication, commencing with the January number, 1910, has been formed by the consolidation of *Industrial Engineering* and *The Engineering Digest*. Robert Thurston Kent, managing editor of *The Engineering Digest* up to the time of the consolidation, has become the managing editor of the new journal, and his father, William Kent (author of Kent's Mechanical Engineer's Handbook), who is president of the Technical Literature Company, will regularly contribute editorial notes and special articles. R. T. Kent began his editorial work as associate editor of the old *Electrical Review*, and was for nearly four years managing editor of the *Iron Trade Review*, of Cleveland, Ohio.

NEW INCORPORATIONS.

MALVERN, O.—The Model Electric Company has been incorporated with a capital of $20,000. The incorporators are: D. Conrad, Henry C. Long, H. W. Pennock and A. B. Bucklin.

NEW ROCHELLE, N. Y.—The John P. Muller Manufacturing Company, of New Rochelle, has been incorporated with a capital stock of $25,000 to manufacture surgical, mechanical and electrical instruments.

COHOES, N. Y.—The Clute Electrical Company has been incorporated with a capital of $5,000, with the following directors: Veeder S. Clute and Alfred J. Clute, of Waterford, and George N. Waterman and Sanford A. Waterman, of Cohoes.

PUTNAM, CT.—The Bliven Manufacturing Co., of this city has been incorporated with a capital of $50,000. Among the incorporators are A. J. Hall, J. Bodo and F. A. Davis of Danielson, J. S. Field of Brooklyn and H. F. Brooks of Dayville.

NEW YORK, N. Y.—The Vita Electric Sign Company has been incorporated with a capital of $200,000 to manufacture and deal in electric signs. The incorporators are: E. J. Prindle, East Orange, N. J.; A. Stewart, Brooklyn, and C. B. Hobbs, Greta River, L. I.

PLAINVILLE, CONN.—The Empire Electric and Manufacturing Company has been incorporated with a capital of $50,000 to manufacture electric fittings. Benjamin Lamb, of Plainville, J. F. Lamb, of New Britain, J. E. Lamb, H. E. Propson, of Plainville, and W. H. Johnston, of New York, are the incorporators.

INDUSTRIAL ITEMS.

THE McROY CLAY WORKS, Brazil, Ind., manufacturers of the well-known McRoy conduits for telephone and telegraph, electric light and power cables, has recently sent out its February calendar blotter.

THE MOORE ELECTRICAL COMPANY, 169 Malvern Street, Newark, N. J., has published a new leaflet devoted to the Moore light window, which is especially adapted for color-matching purposes in textile establishments.

THE UNION ELECTRIC COMPANY, Pittsburg, Pa., announces that its retail store, formerly located at 414 Wood Street and which was destroyed by fire on December 31, 1909, will be reopened February 15, 1910, at 418 Wood Street with a complete and up-to-date stock.

THE METROPOLITAN ELECTRICAL SUPPLY COMPANY, of Chicago, has issued a bulletin describing the Alba reflectors, which it is introducing. These reflectors are said to have particular advantages for use with tungsten lamps. The bulletin will be sent on request to anyone interested.

THE AMERICAN TRANSFORMER COMPANY, Newark, N. J., is distributing a circular describing pole base transformers adapted for ornamental tungsten street illumination. These transformers are compact, weather proof and are of such a size as to fit in the base of ornamental poles for tungsten street lighting systems.

THE NATIONAL METAL MOLDING COMPANY, Pittsburg, Pa., manufacturers of iron and flexible conduits, will install "Sherarduct," its rust-proof, noncorrosive conduit, in the new Hotel Sherman, Chicago, Ill., and the company is sending out post-cards showing a view of the hotel and giving interesting facts about it and "Sherarduct."

THE WESTERN ELECTRIC COMPANY is distributing a neatly arranged booklet devoted to arc lamps and entitled, "The Hawthorn Way." It contains a detailed description of both carbon and flaming arc lamps and also illustrations of the latest types of Hawthorn lamps together with a double page cut of the Hawthorn plant of the company.

THE ELECTRIC STORAGE BATTERY CO., Philadelphia, Pa., describes in bulletin No. 118, the installation of chloride accumulators on the systems of the Otsego and Herkimer Railroad Company. Several illustrations show the battery equipment, generators and switchboard of the plant. A local curve showing the results obtained by battery operation is also given.

THE NERNST LAMP COMPANY, Pittsburg, Pa., in the January issue of *The Glower* illustrates a number of factories and buildings in which Westinghouse Nernst lamps have been installed. There are also a number of humorous and interesting articles and several good jokes. On the last pages there is reproduced a cut of the Westinghouse Nernst ornamental multiple-glower lamp.

THE BUCKEYE ELECTRIC COMPANY, Cleveland, Ohio, in a recently issued folder of attractive appearance, considers the incandescent lamp question from the central-station solicitor's point of view and gives the opinion of a prominent solicitor regarding Buckeye lamps. The folder is devoted particularly to the tungsten filament lamp and contains a good argument on the subject.

THE TRUMBULL ELECTRIC MANUFACTURING COMPANY, Plainville, Conn., is sending out the February number of *Trumbull Cheer*, its regular monthly publication. It contains the names of the winners of the Lincoln cent contest started before Christmas by the Trumbull Company. There are also a number of interesting articles and description and illustrations of the company's products.

THE ELECTRIC APPLIANCE COMPANY, Chicago, Ill., agent for the Electrical Alloy Company, Morristown, N. J., announces that owing to the increasing demand for Ideal and Phenix resistance wire, the latter company has been forced to increase its plant and factory capacity during the past half year. This company is preparing a catalogue which gives the list prices and full information regarding its resistance material.

THE WESTERN ELECTRIC COMPANY, Chicago, Ill., is distributing a folder devoted to "Electrose" arc lamp insulators. These insulators which are made from "Electrose" material are constructed in such a way that with the lamp suspended the insulating material between the metal parts is placed under compression, thereby making the insulator far in excess of ordinary requirements. They are made in all sizes and for all voltages.

THE WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY, Pittsburg, Pa., has secured, through the United States Circuit Court, a temporary injunction preventing the Bullock Electric Manufacturing Company from manufacturing Metal Drum Sleeve Controllers. The case known as the "Metal Drum Sleeve Controller Case" restrains the Bullock company from manufacturing or selling the controllers known as types S.-1 and S.-2.

THE PACIFIC ELECTRIC HEATING COMPANY, Ontario, Cal., is distributing the January issue of "Hot Points", its well-known monthly publication. This number is attractively gotten up and contains a large amount of valuable information relative to the new models of electric flat irons. In addition much space is devoted to the new utility iron. This iron is designed primarily for travelers and combines the flat iron with an electric portable stove.

THE ALLIS-CHALMERS COMPANY, Milwaukee, Wis., has received an order from the Lluvia de Oro Gold Mining Company, of Lluvia de Oro, Chihuahua, Mex., for a 580 horsepower hydraulic turbine to operate under a head of forty feet of water. The turbine is to drive a 400-kilowatt alternator which is also to be furnished by the Allis-Chalmers Company.

H. W. JOHNS-MANVILLE COMPANY, New York, sole selling agents for the well-known line of "Noark" inclosed fuses and accessories manufactured by the Johns-Pratt Company, of Hartford, Conn., announces that on December 14, 1909, the United States Circuit Court of Appeals for the Second District held that the Sachs Company, and Joseph Sachs, its president, have infringed the Sachs patent for inclosed safety fuses, No. 660341, belonging to the Johns-Pratt Company.

THE DELTA-STAR ELECTRIC COMPANY, Chicago, Ill., is distributing pages 1 and 2 of a new loose-leaf price list. This publication is unique in that in addition to the description and list price of high tenson switches it also contains a great deal of technical information explaining the well known delta and star transformer and generator connections. Formulas are also given for calculating the current in three-phase systems and complete tables showing the current values at different kilowatt capacities.

THE WAGNER ELECTRIC MANUFACTURING COMPANY, St. Louis, Mo., is sending out bulletin No. 89, devoted to its type BW polyphase induction motor. It is claimed in this bulletin that the type BW motor combines wound rotor starting characteristics, high starting torque, minimum starting current, squirrel cage operating characteristics, and simplicity of control. All of these features are fully described and the various applications of this type of motor shown by means of illustrations.

THE UNITED STATES LIGHT AND HEATING COMPANY, 30 Church Street, New York City, is about to build at Niagara Falls, New York, a large factory for the manufacture of car lighting equipment, including generators, regulators, storage batteries, etc. This new plant will accommodate the business formerly conducted at the plants of the Bliss Car Lighting Company at Milwaukee, Wisconsin, the National Storage Battery Company at Buffalo, N. .Y., and the existing plant of the United States Light and Heating Company.

THE CINCINNATI BICKFORD TOOL COMPANY has definitely decided to occupy at the earliest date possible its property located between the plants of the Cincinnati Milling Machine Company and the Cincinnati Planer Company, in the factory colony at Oakley, Ohio, just outside of Cincinnati. The Cincinnati Bickford Tool Company manufactures the line of well known upright drills, formerly manufactured by the Cincinnati Machine Tool Company, and the line of well known radial drills, formerly manufactured by the Bickford Drill and Tool Company.

THE ADAMS-BAGNALL ELECTRIC COMPANY, of Cleveland, Ohio, has issued Bulletin No. 85, which is devoted to the A.-B. regenerative flame arc lamp. The special construction of this lamp, with its central and side tubes for circulating the gases around the arc, is described in detail, as well as the advantages in efficiency and carbon life resulting therefrom. These lamps are made to suit all the various types of both direct-current and alternating-current circuits. A special bulletin is in preparation, however, which will describe regenerative arcs adapted for constant current series circuits.

THE AMERICAN CARBON AND BATTERY COMPANY, Signal Hill, East St. Louis, Ill., is distributing two attractive publications, one devoted to motor and generator brushes and the other to railway motor brushes. The former in addition to describing and listing its carbon and graphite brushes for all standard makes of motors and generators, devotes considerable space to circuit-breaker contacts, lighting arresters, and battery carbons. The publication devoted to railway motor brushes contains a complete price list of all railway motor brushes, which includes the various grades of brushes formerally listed, as well as a number of new grades.

DATES AHEAD.

Philadelphia Electrical Exposition, Philadelphia, Pa., February 14 to 26.

Minnesota Electrical Association annual convention, Minneapolis, Minn., March 29, 30 and 31.

Missouri Electric, Gas, Street Railway and Water Works Association, next convention at Jefferson City, Mo., on April 14, 15 and 16.

Florida Electric Light and Power Association, next meeting at Tampa, Fla., April 21.

Iowa Electrical Association and Iowa Street and Interurban Railway Association, annual conventions, Sioux City, Ia., April 20 and 21.

Directory of Electrical and Allied Engineering and Scientific Societies

(Published in the second issue of each month.)

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SOCIETY OF WIRELESS TELEGRAPH ENGINEERS. Secretary, E. D. Forbes, 96 Franklin Street, South Framingham, Mass.
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SOUTHWESTERN ELECTRICAL AND GAS ASSOCIATION. Secretary, E. T. Moore, Dallas, Tex.
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UNDERWRITERS' NATIONAL ELECTRIC ASSOCIATION. Secretary Electrical Committee, C. M. Goddard, 141 Milk Street, Boston, Mass.
VERMONT AND NEW HAMPSHIRE INDEPENDENT TELEPHONE ASSOCIATION. Secretary-treasurer, E. B. Seeley, St. Johnsbury, Vt.
VERMONT ELECTRICAL ASSOCIATION. Secretary, A. B. Marsden, Manchester, Vt.
VIRGINIA STATE INDEPENDENT TELEPHONE ASSOCIATION. Secretary, B. L. Fisher, Rocky Mount, Va.
WESTERN SOCIETY OF ENGINEERS. Secretary, J. H. Warder, Monadnock Block, Chicago, Ill.
WISCONSIN ELECTRICAL ASSOCIATION. Secretary, John S. Allen, Lake Geneva, Wis.
WISCONSIN INDEPENDENT TELEPHONE ASSOCIATION. Secretary, J. C. Crowley, Jr., Superior, Wis.

RECORD OF ELECTRICAL PATENTS.

Issued (United States Patent Office) February 1, 1910.

947,781. APPARATUS FOR ALTERNATING THE POLARITY OF CURRENT IN ELECTRIC CIRCUITS. Garrison Babcock, Rochester, N. Y., assignor to Telechronometer Company, Rochester, N. Y. Filed June 14, 1909. Two generators are arranged in series and connected so as to be of opposite polarity. The fields are alternately excited, and means are associated with the generators for absorbing the varying current of each polarity produced during the operation of one or the other of the generators.

947,821. CONTACT DEVICE FOR ELECTRICALLY-WOUND MECHANISMS. Benjamin F. Kessler, Mount Carmel, Pa. Filed February 9, 1909. Straight parallel platinum electrodes extend

into one end of a tubular glass contact chamber containing mercury. These project beyond the end of the chamber and terminate in wiring attachment loops. A tubular casing fitting and entirely covering the chamber has a rocking arm attached to one end, the other end being closed by a non-conducting plug having perforations through which the electrodes project and with the walls of which they have bracing contact.

947,849. ELECTRIC FURNACE. James H. Reid, Newark, N. J. Filed May 8, 1909. Below the electrodes are means to receive the material passing off the same and to separate the lighter from the heavier constituents.

947,853. ROTARY CURRENT-BREAKER. Herman Ruthardt, Stuttgart, Germany. Filed September 4, 1908. A roller rolls between an inclined plane and a contact-carrying spring, both carried by the inner, rotatable part of the current breaker which part carries also a second contact. A lug carried by the fixed part of the breaker projects into the normal path of the roller.

947,860. OIL-SWITCH. Henry L. Smith, Schenectady, N. Y., assignor to General Electric Company. Filed May 24, 1906. Pivoted on a suitable base is an operating lever, the locking toggle for which comprises a link pivoted to the base on one side of the lever. A second link is pivoted near its center to the operating lever, one end of this link being pivoted to the first link, the other end being free to extend beyond the operating lever. A latch on the base on the other side of the lever is provided to engage the other end of the second link to prevent the collapse of the toggle.

947,866. LOCK. John W. H. Taylor, Pomona, Cal. Filed April 19, 1909. The lock is electromagnetically operated.

947,878. FUSELESS ROSETTE. Herbert C. Wirt, Schenectady, N. Y., assignor to General Electric Company. Filed Jan. 15, 1902. A rosette for supporting knotted branch-wires comprises a single piece of ceramic insulating material provided with a straight transverse aperture of sufficient size to receive the knot, wtih a central aperture connecting with the transverse aperture, and of a size to receive only the branch-wires, and with means of making contact between wires.

947,881. SNAP-SWITCH. Henry P. Ball, New York, N. Y., assignor to General Electric Company. Filed December 4, 1905. Comprises a guide, a movable switch member slidable thereon, a double-ended latch to lock this member in extreme positions, an actuator having means for tripping this latch, and a spring connecting the actuator and the member and tensioned in the same direction on both movements of the actuator.

947,882. ELECTRIC AIR-COMPRESSOR. Asa F. Batchelder, Schenectady, N. Y., assignor to General Electric Company. Filed September 3, 1901. The driving motor has an axially removable drive shaft, etc.

947,885. INSULATOR. William S. Cone, Visalia, Cal. Filed April 29, 1907. A divided cable has its ends provided with suitable clamps, and a bar of rigid insulating material has rounded ends loosely held in the clamps, respectively.

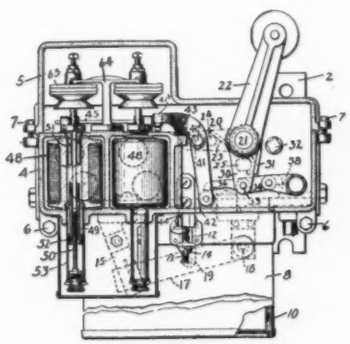
947,956. METERING PANEL-BOARD. John J. Agutter, Seattle, Wash. Filed May 24, 1909. A switchboard comprises a base on which are two series of conductors spaced from and crossing one another, contact members slidably supported on the conductors of one series, other contact members carried by the first-named contact member, and means on the other series of conductors for securing the last-named contact members thereto.

947,966. TELEPHONE-TRANSMITTER. Evan T. Evans, Westerville, Ohio. Filed September 22, 1909. A disinfectant receptacle communicates with the interior of the mouthpiece.

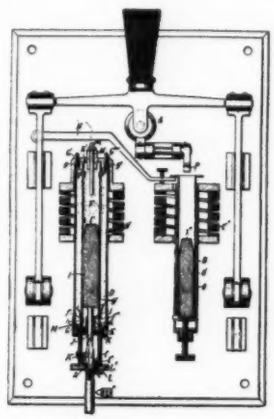
947,979. ELECTRIC-ARC LAMP. Theodor J. Rensing, Leipzig, Germany, assignor to Körting & Mathiesen Aktiengesellschaft, Leutzsch, near Leipzig, German. Filed August 14, 1908. In combination with an economizer is an outer globe provided with a passage situated at the lower portion of the globe and leading to the outside of the lamp for the inlet of air; an inner globe open top and bottom communicates with the outside of the lamp for the discharge of air therefrom and extends below the arc-forming portion of the electrodes, the outer globe being closed except for the air inlet and the opening formed by the inner globe.

947,981. ELECTRICAL TIME-LIMIT SWITCH. Philip K. Stern, New York, N. Y., assignor to General Electric Company. Filed March 18, 1902. A freely movable member of magnetic material is so related to an electromagnetic coil (included in the electric circuit) that normally it lies beyond the effective magnetic field of the coil when the current has a predetermined value. The member is, however, caused to move into the effective field, by a device which includes a time limit, under certain other current conditions.

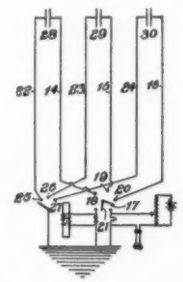
947,983. PURIFYING TANTALUM. Ezechiel Weintraub, Schenectady, N. Y., assignor to General Electric Company. Filed October 3, 1906. A molten double salt of tantalum is electrolyzed between an anode of impure tantalum, and a cathode, to deposit pure tantalum on the latter.



947,860.—OIL-SWITCH.



947,981.—ELECTRICAL TIME-LIMIT SWITCH.



948,068.—WIRELESS TELEGRAPHY.

947,987. ATTACHING-PLUG. John C. Dallam, Schenectady, N. Y., assignor to General Electric Company. Filed August 19, 1905. Comprises a receptacle, two clips therein, a faceplate having openings registering with the clips, and a plug carrying two inclosed fuses adapted to pass through the openings into the clips.

947,993. PROJECTOR-LAMP. James W. Kellogg, Schenectady, N. Y., assignor to General Electric Company. Filed July 24, 1908. Describes an arc-lamp mechanism and connections.

948,010. ELECTRIC COUPLER-ACTION FOR ORGANS. Jacob O. Funkhouser, Hagerstown, Md. Filed February 6, 1909. An electrically coupled pipe organ embodies a plurality of wind chests, a pipe-controlling magnet in each wind chest, a switch magnet, an electric circuit in which the switch magnet is included, a key having a single contact member arranged to open and close the circuit, other electric circuits, in each of which one of the pipe-controlling magnets is included, said circuits each including also a switch point, an armature in all of said last-named circuits arranged to engage all of the switch points upon the energization of the magnet for the purpose specified, and stop switches in the last-named circuits.

948,041. COMBINED ELECTRIC CONNECTING PLUG, SOCKET, AND SWITCH. William W. Buckton, Westminster, London, England. Filed April 24, 1909. A plug for use with a combined electric connecting plug socket and switch mechanism, comprises a spring-controlled revoluble portion, and a loosely fitting ring surrounding the handle of the plug and arranged to allow of a limited turning movement between the plug and ring.

948,055. ALARM SYSTEM. Oliver B. Kaiser, Madisonville, Ohio, assignor of one-third to Walter S. Ludlow and one-third to Walter S. Ludlow, Jr., Cincinnati, Ohio. Filed June 20, 1908. Describes an automatic electric alarm system.

948,056. ELECTROPLATING APPARATUS. Willis R. King, Newark, N. J., assignor to Hanson & Van Winkle Co. Filed Sept.

30, 1909. Agitators are fixed on contact rods which support the piece of work to be plated.

948,068. WIRELESS TELEGRAPHY. Reginald A. Fessenden, Washington, D. C., assignor to The National Electric Signaling Company, Pittsburg, Pa. Original application filed July 27, 1903. Divided and this application filed July 15, 1905. The method of tuning an antenna consists in providing multiple aerials and altering the capacity by connecting one of them in electrostatic inductive relation with others of the aerials.

948,086. DIRECTED WIRELESS TELEGRAPHY. Ettore Bellini and Alessandro Tosi, Paris, France. Filed March 2, 1909. Means applicable to the transmitting and receiving apparatus in all systems of directed wireless telegraphy consist in the combination of a dirigible system and a uniformly radiating system the aerial part of which is arranged substantially coincident to the symmetrical axis of the aerial of the dirigible system and the electric action of which is substantially in phase or in opposition to that of the dirigible system and has equal or substantially equal amplitudes to those of the electric action of the dirigible system.

948,088. METAL TELEGRAPH, TROLLEY, AND LIKE POLE. James F. Craven, Pittsburg, Pa. Filed Jan. 15, 1909. A metal pole comprises vertical flanged bars and flat lattice members welded to the flat faces of the vertical bars thereby forming a substantially integral structure.

948,095. ELECTRIC-LIGHT FIXTURE. William A. Hutton, Scranton, Pa. Filed July 8, 1908. Renewed Sept. 16, 1909. Describes a kind of vertical standard.

948,109. ELECTRIC-LIGHT-PULL INSULATOR. Thomas M. Harrigan, Woodstock, Vt. Filed March 8, 1909. In combination with an electric light switch pull chain, having a knob on its free end, is an outer knob of insulating material held on the chain by the knob.

948,111. BATTERY-BOX. Russell W. Magna, Holyoke, Mass. Filed Oct. 1, 1908. In combination with a stationary contact in the box is a snap-contact comprising pivotally-connected members having concave nose-pieces which are interiorly cut to engage the screw-threads of a binding post, the axis of such nose-pieces being at right angles to the axis of the pivotal connection. There is a flexible connection between the box and the snap-contact.

948,275.—ELECTRORHEOSTAT REGULATOR.

948,154. ELECTRIC LOCOMOTIVE. William E. Woodard, Schenectady, N. Y. Filed Aug. 26, 1909. An independent frame or bed for supporting auxiliary electrical apparatus of electric locomotives, comprises a metal base and top, vertical end members connecting this base and top, and a flooring of insulating material supported on the base.

948,156. SYSTEM FOR THE TRANSMISSION OF ELECTROMAGNETIC WAVES WITH SOUND-REGULATED FREQUENCIES. Walter H. Bathrick, Somerville, Mass. Filed April 3, 1908. A system for the transmission of sound-controlled electro-radiant energy comprises a pair of secondaries of a sound-controlled primary, a pair of primaries connected with the secondaries, a primary generator of high-frequency current, and a secondary connected with the conductors of electrical oscillations.

948,190. MANUFACTURE OF METALLIC SILICIDS. George Strauss, Paris, France, assignor to Société Anonyme La Compagnie Generale D'Electro-Chimie de Bozel, Paris, France. Filed April 16, 1908. The process of producing calcium silicids consists in heating an intimate mixture containing carbon, metallic silicon prepared in an electric furnace, and a calcium derivative, whereby the formation of a difficulty reducible compound is prevented.

948,254. PUMPING MECHANISM FOR CARPET-CLEANING MACHINES. Walter Schussler, Philadelphia, Pa. Filed Oct. 3, 1908. Is driven by an electric motor.

948,275. ELECTRORHEOSTAT-REGULATOR. Hugo Gernsback, New York, N. Y. Filed Sept. 1, 1908. A resistance coil is adapted to be sprung lengthwise into an annular groove in an insulating base in the center of which is mounted a movable contact arm provided at its outer end with a hollow knob containing a coiled spring, the free end of which abuts against a metal or carbon ball. This ball engages one convolution of the resistance coil at a time to obtain an almost imperceptible variation in electric current strength.

948,285. ADVERTISING DEVICE. Elias A. Lyon, Yonkers, N. Y. Filed Sept. 22, 1905. In combination with a telephone is a movable advertising device adapted to be electrically operated. A contact in the circuit of the device is adapted to be made by the releasing of the receiver hook of the telephone, and a magnet is adapted to short-circuit this contact, the magnet being actuated by the current passing through the circuit.

948,293. BALL-CLUTCH FOR ARC-LAMPS. John T. Beechlyn, Lynn, Mass., assignor to General Electric Company, a Corporation of New York. Filed July 17, 1908. A ball clutch for flaming-arc-lamp chimneys comprises a tripping collar having slots in its upper edge, balls in these slots, a sheet-metal ball-retainer inside of the collar having an external flange at its upper end, and a clutch ring surrounding the collar and having an inverted conical inner surface.

948,296. ELECTRIC FUSIBLE CUT-OUT. Ernest Schattner, Ealing, England. Filed June 11, 1907. A fusible cut-out comprises a chamber, a fuse and a filling material therein, and means adapted to liberate a cooling fluid on the rupture of the fuse.

PATENTS THAT HAVE EXPIRED.

Following is a list of electrical patents (issued by the United States Patent Office) that expired February 7, 1910:

491,095. ELECTRIC ARC LAMP. Wallace E. Freeman, Long Island City, New York, N. Y.

491,106. BIPOLAR ELECTRICAL MACHINE. Thomas H. Hicks, Detroit Mich.

491,124. ARC-LIGHT CARBON. Jas. McLaughlin, Chicago, Ill.

491,132. INCLOSED CONDUCTOR FOR ELECTRIC RAILWAYS. Frank C. Perkins, Dunkirk, N. Y.

491,133. PRINTING TELEGRAPH RECEIVER. Major D. Porter, Brooklyn, N. Y.

491,163. VIBRATORY TELEGRAPHY. Stephen D. Field, Yonkers, N. Y.

491,171. RETOUCHING DEVICE. Albert S. Harry, Steubenville, Ohio.

491,250. TESTING APPARATUS FOR MULTIPLE SWITCHBOARD SYSTEMS. Chas. E. Scribner, Chicago, Ill.

491,251. DUPLEX ELECTRIC ARC-LAMP. Chas. E. Scribner, Chicago, Ill.

491,252. METALLIC CIRCUIT FOR MULTIPLE SWITCHBOARD SYSTEMS. John A. Seely, New York, N. Y.

491,275 TELEPHONE TRANSMITTER. Harry L. Tyler, Corning, N. Y.

491,294. DYNAMO-ELECTRIC MACHINE. Gabriel V. M. A. Parrot and Antoine C. Reignier, Paris, France.

491,311. ELECTRICALLY HEATED SOLDERING IRON. Samuel D. Jenkins, Boston, Mass.

491,321. ELECTRICALLY HEATED SMOOTHING IRON. Samuel B. Jenkins, Boston, Mass.

491,313. ELECTRIC CURLING IRON HEATER. Samuel B. Jenkins, Boston, Mass.

491,320. ELECTRIC WATER HEATER. Willis Mitchell, Malden, Mass.

491,321. ELECTRICALLY HEATED VESSEI. Willis Mitchell, Malden, Mass.

491,322. ELECTRICALLY HEATED GRIDIRON. Willis Mitchell, Malden, Mass.

491,339. ELECTRIC CLOCK. John H. Dyson, Belleville, Wis.

491,346. ELECTRO-MECHANICAL MOVEMENT. Elisha Gray, Highland Park, Ill.

491,347. TELAUTOGRAPH. Elisha Gray, Highland Park, Ill.

491,361. ELECTRIC RAILWAY TROLLEY. Benjamin Kochs and Albert Kochs, St. Louis, Mo.

491,369. ELECTRIC LOCK. Oliver A. Moyer and Henry W. Rhodes, Ogden, Utah.

491,387. ELECTRIC CIRCUIT FOR RAILWAY SIGNALING. Louis Thaler, New York.

491,394. PROCESS OF ELECTRICALLY REDUCING ALLUMINUM AND FORMING ALLOYS THEREOF. Thomas L. Willson, Brooklyn, N. Y.

491,412. WINDLASS FOR LOWERING OR RAISING STREET ELECTRIC LAMPS. Chas. R. Eddy, Springfield, Mo.

491,426. COMBINED ELECTRIC SWITCH AND DOOR LOCK. John H. L. Holcombe, U. S. Navy.

491,437. ELECTRIC HEATING DEVICE. Willis Mitchell, Malden, Mass.

491,438. ELECTRICALLY HEATED MUFFLE. Willis Mitchell, Malden, Mass.

491,457. ELECTRICAL MEASURING INSTRUMENT. Elmer C. Willyoung, Philadelphia, Pa.

491,465. ELECTRICAL TRANSMISSION OF POWER. Chas. S. Bradley, Avon, N. Y.

REISSUE NO. 11,303. METHOD OF INSULATING ELECTRIC CONDUCTORS. Thomas E. Morford, Chicago, Ill.

REISSUE No. 11,306. MULTIPLE SWITCHBOARD SYSTEM. Chas. E. Scribner, Chicago, Ill.